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ANNUAL REPORT
OF THE
Indian Central Cotton Committee,
BOMBAY,

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Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1932.

CHAPTER I.

THE Central Cotton Committee was constituted by Resolution No. 104-22, dated the 31st March 1921, of the Government of India in the Department of Revenue and Agriculture. Originally it was purely an advisory body, but with the passing of the Cotton Cess Act in 1923, it was incorporated and provided with funds "for the improvement and development of the growing, marketing and manufacture of cotton in India." The Committee thus fulfils two main functions. It advises the Government of India and Local Governments on matters connected with the growing and marketing of cotton and brings to their notice matters which, in its opinion, require attention. Secondly, it provides funds for research into cotton problems designed for the benefit of the whole of India or for large tracts where cotton is an important crop. The research part of the Committee's work has now reached the stage of showing practical results, as will be seen in this report.

The Committee, in addition, serves as a common meeting-ground for all branches of the cotton industry. All main interests connected with cotton consisting of the grower, the agricultural expert, the ginner, the exporter and the millowner are represented on the Committee, as will be seen below, and there is no branch of cotton industry in India on which the Committee cannot give expert advice. The Committee, however, pays special attention to the interests of the grower whose welfare is its chief concern.

PERSONNEL.

2. The members of the Committee on the 31st August 1932 were as follows. Under the Indian Cotton Cess Rules, members hold office for three years and one-third of their number retire each year in rotation.

- (1) **PRESIDENT.**—Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*.

- (a) The Expert Adviser to the Imperial Council of Agricultural Research in agricultural matters, *ex-officio*.

- (2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.
- | | |
|-----------------------------|--|
| <i>Madras</i> | Mr. S. V. Ramamurty, I.C.S., Director of Agriculture. |
| <i>Bombay</i> | The Director of Agriculture. |
| <i>United Provinces</i> .. | Mr. P. B. Richards, I.A.S., Entomologist to Government. |
| <i>Punjab</i> | The Director of Agriculture. |
| <i>Central Provinces</i> .. | Mr. F. J. Plymen, C.I.E., I.A.S., Director of Agriculture. |
| <i>Burma</i> | Mr. F. D. Odell, I.A.S., Deputy Director of Agriculture. |
- (3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.
- (4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.
- | | |
|---|---|
| The East India Cotton Association | Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E. |
| The Bombay Mill-owners' Association .. | Mr. S. D. Saklatvala. |
| The Bombay Chamber of Commerce .. | Sir Joseph A. Kay, Kt. (<i>Vice-President</i>). |
| The Indian Merchants' Chamber | Mr. Chunilal B. Mehta. |
| The Karachi Chamber of Commerce .. | Mr. J. O. G. Barnes. |
| The Ahmedabad Mill-owners' Association .. | Sheth Naranlal Jivanlal. |
| The Tuticorin Chamber of Commerce .. | Mr. J. Vonesch. |
| The Upper India Chamber of Commerce .. | Mr. J. Tinker. |
| The Empire Cotton Growing Corporation | Mr. W. Roberts. |
- (5) and (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.
- | | |
|-----------------------------|---|
| <i>Central Provinces</i> .. | { Mr. Y. G. Deshpande.
Rao Bahadur G. R. Kothare, M.L.C. |
| <i>Madras</i> | |
| <i>Punjab</i> | Mr. Robert Lee. |
| | Khan Bahadur Sardar Habibullah, M.L.C. |
| <i>Bengal</i> | Mr. Nalini Ranjan Sarkar. |
- (7) CO-OPERATIVE BANKING REPRESENTATIVE—Sardar Sampuran Singh.

(8) REPRESENTATIVES OF COTTON GROWING INDUSTRY.

<i>Madras</i> .. ..	..	{	The Honourable Mr. V. C. Vellingiri Gounder.
		{	M. R. Ry. K. Sarabha Reddi Garu, M.L.C.
		{	Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C.
<i>Bombay</i> .. ..	..	{	Rao Saheb Chinbasappa Shidramappa Shirahatti.
		{	Khan Bahadur Maulvi Mohammad Obai- dur Rahman Khan, M.L.C.
<i>United Provinces</i>	..	{	Rao Bahadur Rao Bikram Sinha, M.L.C.
		{	Major D. Vanrenen.
<i>Punjab</i> .. ..	..	{	Mian Nurullah, M.L.C.
<i>Central Provinces and Berar.</i>		{	Rao Bahadur M. G. Deshpande. Mr. M. P. Kolhe, M.L.C.

(9) and (10) REPRESENTATIVES OF INDIAN STATES.

<i>Hyderabad State</i>	..	Mr. B. A. Collins, C.I.E., I.C.S., Director- General and Secretary to Government, Department of Commerce and Indus- tries.
<i>Baroda State</i> ..	..	Mr. C. V. Sane, Director of Agriculture.
<i>Gwalior State</i> ..	..	Mr. H. H. Pandya, Agricultural Adviser to Gwalior Government.
<i>Rajputana and Central India States</i> ..	..	Mr. F. K. Jackson, Director, Institute of Plant Industry, Indore.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL IN COUNCIL.

1. Mr. D. N. Mahta, Economic Botanist for Cotton, Central Provinces.
2. Dr. W. Burns, I.A.S., Principal, Agricultural College, Poona.
3. Dr. L. C. Coleman, C.I.E., Director of Agriculture, Mysore State.
4. M. R. Ry. V. Ramanatha Ayyar, Avl., Cotton Specialist Coimbatore.
5. Mr. C. R. Palaiet, Member for Commerce and Industry Holkar Durbar, Representative of the Indore State.
6. Mr. W. J. Jenkins, I.A.S., Chief Agricultural Officer in Sind Karachi.
7. Mr. Girdharlal B. Kotak, Representative of the Karachi Indian Merchants' Association, Karachi.
8. Rai Saheb Ram Prasad Singh, Assistant Economic Botanist Government, United Provinces.
9. Mr. Mohammad Azhar Ali, M.L.A., Lucknow.
10. Mr. Gulam Mohammad Khan, Representative of the Cotton Growers of Sind.

11. Lala Shri Ram, Representative of the Cotton Millowners of Delhi.

Secretary.—Mr. J. H. Ritchie, I.A.S. (on leave from the 25th June 1932).

Deputy Secretary.—Mr. P. H. Rama Reddi, I.A.S. (Officiating Secretary).

Director, Technological Laboratory.—Dr. Nazir Ahmad.

Publicity Officer.—Mr. R. D. Mihra.

Sir Joseph A. Kay was re-elected Vice-President for the year 1932-33. He was on leave out of India from April 11th to October 27th, 1932.

SUB-COMMITTEES.

3. *Standing Finance Sub-Committee.*—The following members were appointed to form the Standing Finance Sub-Committee as required by the Rules under the Indian Cotton Cess Act :—

Sir Joseph A. Kay (*Vice-President*), *Chairman* : Dewan Bahadur Sir T. Vijayaraghavacharya (*ex-officio*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Rao Bahadur M. G. Deshpande, Mr. D. McCallum and Mr. Chunilal B. Mehta.

Mr. Vonesch was on leave out of India from April 11th to September 5th and his place on the Sub-Committee was temporarily filled by Sheth Naranlal Jivanlal.

Mr. McCallum resigned from the Committee on July 12th, 1932, and Mr. J. O. G. Barnes was appointed in his place.

The Sub-Committee met eight times during the year.

4. The *Local Sub-Committee* consists of all members living in or near Bombay though any member of the Committee may attend its meetings. The Sub-Committee was constituted as follows :—

Dewan Bahadur Sir T. Vijayaraghavacharya (*President*), Sir Joseph A. Kay (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Rao Bahadur M. G. Deshpande, Mr. D. McCallum and Mr. Chunilal B. Mehta.

Mr. McCallum resigned in the course of the year and his place was taken by Mr. J. O. G. Barnes.

Eight meetings were held during the year. The Sub-Committee, at a special meeting held on the 15th December 1931, discussed the question of granting licenses by the Director of Agriculture, Bombay Presidency, to the importers of cotton, Hyderabad State, and it was attended by invitation by the following :—

- Mr. S. S. Salimath, Deputy Director of Agriculture, Southern Division, Dharwar.
- Mr. M. V. Chitnis, Cotton Marketing Officer, Kopbal.
- Rao Saheb V. P. Chavadi, President, Taluka Local Board, Gadag.
- Mr. L. B. Laksmeshwar, President, Taluka Development Association, Gadag and Member, Divisional Board of Agriculture, Dharwar.
- Mr. T. V. Koti, President, Gadag-Bettigeri Municipality.
- Mr. M. V. Koti, Vice-President, Dalals' Association, Gadag, and Member, Divisional Board of Agriculture, Dharwar.
- Mr. S. S. Yelamali, Director, Ginning and Pressing Association, Gadag, and Vice-President, Gadag Co-operative Cotton Sale Society, Ltd.
- Mr. V. A. Shetty, Manager, The Gadag Co-operative Cotton Sale Society, Ltd.

5. *Cotton Ginning and Pressing Factories Sub-Committee.*—This Sub-Committee is also a statutory body appointed to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. The Sub-Committee was composed of the following members :—

- Sir Joseph A. Kay (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Mr. D. McCallum, Mr. J. Vonesch, Mr. Chunilal B. Mehta, Mr. W. Roberts, Mr. H. B. Moore, Mr. J. Tinker, Mr. Y. G. Deshpande and Sardar Sampuran Singh.

Messrs. H. B. Moore and D. McCallum resigned from the Sub-Committee on February 23rd and July 12th, 1932, respectively, and the question of the appointment of their successors will be taken up at the next meeting of the Sub-Committee.

The Sub-Committee met only once during the year, the most important subject dealt with being the licensing of ginning and pressing factories.

6. *Sub-Committee on Malpractices.*—The composition of this Sub-Committee was as follows :—

- Sir Joseph A. Kay (*Vice-President*), Mr. S. D. Saklatvala, Sir Purshotamdas Thakurdas, Mr. D. McCallum, Mr. Chunilal B. Mehta, Mr. T. F. Main and Rao Bahadur Bhimbhai Ranchodji Naik.

Mr. McCallum resigned from the Committee on July 12th, 1932, and the question of appointing a successor to him on the Sub-Committee will be taken up when the Sub-Committee next meets.

The Sub-Committee did not meet during the year

7. *Agricultural Research Sub-Committee.* This Sub-Committee meets twice every year just before the meetings of the full Committee and reports on the progress made on the schemes financed by the Committee and examines fresh proposals for new schemes. The following members were appointed at the December 1931 meeting of the Committee.

The President, The Vice-President (Sir Joseph A. Kay), Mr. F. K. Jackson, Sardar Sampuran Singh, Mr. W. Roberts, Sir Purshotamdas Thakurdas, Mr. T. F. Main, Mr. F. J. Plymen, Mr. D. Milne, Mr. V. Ramanatha Ayyar; Mr. B. C. Burt, Dr. L. C. Coleman, Dr. W. Burns, Mr. D. N. Mahta, Rai Sahib Ram Prasad Singh, Mr. H. H. Pandya, Mr. W. J. Jenkins, Mr. P. B. Richards, Mr. B. A. Collins, Mr. D. G. Munro and Mr. C. V. Sane (additional members); the successor to the Cotton Research Botanist, Lyallpur (co-opted member), and the Secretary.

Sir Joseph A. Kay, Dr. W. Burns and Messrs. W. Roberts, B. C. Burt, D. N. Mahta and W. J. Jenkins were on leave out of India during the July meeting and the vacancy caused by the resignation of Mr. D. G. Munro remained unfilled. Messrs. S. V. Ramamurty and Roger Thomas, Dr. W. McRae and Rai Sahib Kalidas Sawhney were co-opted on the Sub-Committee at its July meeting. The successor to the Cotton Research Botanist, Lyallpur, has not yet been appointed.

The Sub-Committee met twice during the year.

8. *Technological Research Sub-Committee.* -This Sub-Committee meets during the half-yearly meetings of the Central Cotton Committee and deals with all matters connected with the Technological Laboratory and Technological Research. The Sub-Committee appointed in December 1931 consisted of the following members: -

The President, Sir Joseph A. Kay (*Vice-President*), Mr. S. D. Saklatvala, Mr. B. C. Burt, Mr. D. Milne, Mr. T. F. Main, Mr. Chunilal B. Mehta, Mr. Y. G. Deshpande, Sheth Naranlal Jivanlal and the following co-opted members:

Sir Munmohandas Ramji	..	} Representatives of Bombay Mill-owners' Association.
Mr. F. Stones	..	
Sir Chinubhai Madhowlal	..	} Representatives of Ahmedabad Millowners' Association.
Seth Chamanlal G. Parekh	..	
Mr. Bhaidas Nanlal	..	} Representatives of East India Cotton Association.
Mr. R. G. Saraiya	..	

During the year Seth Kasturbhai Lalbhai took the place of Sir Chinubhai Madhowlal. Dr. W. McRae and Sir Purshotamdas Thakurdas were co-opted on the Sub-Committee at its July meeting.

9. *Research Students Selection Sub-Committee.*—The following members were appointed to form the Research Students Selection Sub-Committee :—

The President, Sir Joseph A. Kay (*Vice-President*), Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Mr. B. C. Burt, Dr. W. Burns, Mr. P. B. Richards, Mr. D. Milne, Mr. F. J. Plymen, Dr. L. C. Coleman, Mr. H. H. Pandya, Mr. T. F. Main, Mr. W. J. Jenkins, Mr. C. V. Sane, Mr. F. K. Jackson and Dr. Nazir Ahmad.

The Sub-Committee did not meet during the year as no studentships were awarded.

10. *Special Sub-Committees.*—As required by the Rules under the Indian Cotton Cess Act, a Special Sub-Committee met twice during the year to select a candidate for the post of Publicity and Propaganda Officer, the creation of which was sanctioned by the Committee.

A Special Sub-Committee consisting of Dewan Bahadur Sir T. Vijayaraghavacharya, Sir Purshotamdas Thakurdas, Rao Bahadur Bhimbhai Ranchodji Naik, Rao Bahadur M. G. Deshpande and Messrs. S. D. Saklatvala, Chunilal B. Mehta, T. F. Main, S. V. Ramamurty and Roger Thomas, was appointed by the Local Sub-Committee to draft a reply to a reference from the Indian Tariff Board in connection with its enquiry into the Cotton Textile Industry. The Sub-Committee met three days consecutively.

One more Special Sub-Committee consisting of Sir Joseph A. Kay, Mr. B. C. Burt, Mr. D. Milne and Mr. Chunilal B. Mehta was appointed by the full Committee to discuss with the representatives of the Government of the United Provinces the proposed Pink Boll-worm Extension Scheme in the United Provinces. The Sub-Committee with Mr. W. Roberts as an additional member met the Minister for Education and Agriculture at Lucknow on the 18th February 1932.

11. Most of the detailed work is carried on by means of these Sub-Committees which are composed mainly of the Bombay members, and the full Committee is thereby saved considerable time at its half-yearly meetings. The members of the Sub-Committees, particularly the Bombay members, have, as usual, spared no time in the Committee's work and the success which the Committee has achieved is largely due to their whole-hearted efforts.

(a) Mr. S. D. Saklatvala resigned his appointment as representative of the Indian Central Cotton Committee on the Imperial Council of Agricultural Research and Rao Bahadur Bhimbhai Ranchodji Naik was appointed in his place.

(b) During the year the East India Cotton Association amended Article 51 of the Articles of its Association relating to the constitution of its Board

Under the amended Article the Committee is authorised to nominate two of its members from among its growers' representatives, and Rao Bahadur Bhimbhai Ranchodji Naik and Mr. M. P. Kolhe were appointed as members for 1932-33.

(c) At the request of the Scientific Advisory Board of the Indian Lac Cess Committee, the Indian Central Cotton Committee agreed to the appointment of Dr. Nazir Ahmad, Director, Technological Laboratory, as a member of the Board.

(d) In response to a request from the Imperial Council of Agricultural Research, the Committee approved of the appointment of Dr. Nazir Ahmad as a member of its Research Council and of its Advisory Board.

MEETINGS.

12. The Indian Central Cotton Committee held two meetings during the year on the 14th and 15th December 1931 and on the 1st and 2nd August 1932. Mr. G. Boyagis of Messrs. Langley & Co., Bombay, and Mr. Haridas Madhavdas, Acting President of the East India Cotton Association, attended the December meeting as visitors.

13. The Committee discussed the subject of the "Discretionary use of Committee papers and Minutes of meetings by members of the Committee" and decided that Directors of Agriculture and representatives of Trade Associations might use their discretion in showing to their Local Governments and Associations those papers circulated for meetings and portions of the Minutes in which they are interested, but on no account should any matter from them be published or given to the Press.

A list of the important resolutions passed at these two meetings will be found in *Appendix I*.

STAFF.

14. Mr. J. H. Ritchie held charge of the office of Secretary till June 25th when he proceeded on six months' leave.

Mr. P. H. Rama Reddi continued as Deputy Secretary till the date of Mr. Ritchie's departure on leave when he was appointed to officiate as Secretary.

The appointment of Deputy Secretary remained vacant from June 26th.

Mr. R. D. Mihra was appointed as Publicity and Propaganda Officer with effect from June 1st, 1932,

Dr. Nazir Ahmad held the post of Director, Technological Laboratory, during the year.

Mr. R. P. Richardson, Spinning Master at the Technological Laboratory, was on leave for one month and 25 days and Mr. D. F. Kapadia, Assistant Technologist, acted for him.

Mr. Mohammad Afzal, Senior Assistant in the Punjab Botanical Scheme, continued to hold charge of the duties of Cotton Research Botanist during the year.

PROVINCIAL AND LOCAL COTTON COMMITTEES.

15. Provincial and Local Cotton Committees met as follows during the year :—

Central Provinces Provincial Cotton Committee	..	Twice.
Punjab Provincial Cotton Committee .. ..	..	Once.
Madras Local Cotton Committees.. ..	..	Five times.
Sind Cotton Committee .. ..	..	Once.

The Karnatak Board of Agriculture discussed matters concerning cotton at two of its meetings and the Gujerat Divisional Board of Agriculture at one of its meetings. The United Provinces Provincial Cotton Committee has temporarily ceased to function while the Burma Provincial Cotton Committee has been abolished.

At its meeting held in August 1932, the Committee passed the following resolution :—

“ The Indian Central Cotton Committee has read with great interest the proceedings of the Central Provinces, Sind and Punjab Cotton Committees and trusts that the good work that is being done by these bodies will be of permanent value to the cotton industry of the provinces concerned.”

The Committee also decided at the same meeting to bring to the notice of Local Governments the desirability of members of the Indian Central Cotton Committee being appointed to Provincial Cotton Committees in their respective provinces.

CHAPTER II.

FEATURES OF THE YEAR.

A. SEASON.

16. THE year under report has been abnormal in several respects. The area under cotton fell from 23,812,000 acres in the previous year to 23,522,000 acres in the year under report, which is the lowest area recorded since 1922-23, but heavier still was the decline in yield chiefly due to the failure of the Oomras and Bengal-Sind cottons owing to untimely or excessive rainfall. The total estimated yield for the season was 4,064,000 bales of 400 lbs. as compared with 5,224,000 bales for the preceding season. The average yield per acre was as low as 69 lbs., a figure lower by 12 lbs. than the lowest on record during the past one decade.

The returns of cotton pressed during the season 1931-32 show that 2,408,551 bales were pressed in British India and 903,991 bales in Indian States, making a total of 3,312,542 bales for the whole of India as compared with 4,914,297 bales pressed during 1930-31. The quantity of loose cotton received by the mills during the season amounted to 210,000 bales of 400 lbs. as against 148,700 bales of the previous season. The total crop of the season thus accounted for by the press returns and loose cotton received at the mills was only 3,522,542 bales.

The abnormal conditions which prevailed during the year under review kept up the prices of Indian cotton above parity with American cotton with the result that the export demand for Indian cotton fell off and imports of American cotton into India considerably increased. For this reason and also due to the low yield, the world's total consumption of Indian cotton fell from 5,863,000 bales in 1930-31 to 4,789,000 bales in 1931-32. The quantity of Indian cotton consumed by the Indian mills went up, however, to 2,345,078 bales of 400 lbs. (vide *Appendix IV*), an increase of 75,719 bales over the previous season's consumption. The appendix also shows the rapid expansion that is taking place in the Madras Presidency, United Provinces, Delhi and in the Indian States as consuming centres for Indian cotton.

Exports of Indian cotton during the year under review fell to 1,582,000 bales of 400 lbs. from 3,729,000 bales in 1930-31 and 3,998,000 bales in 1924-25, the previous record season. The low yield of cotton was off-set by the fall in export demand and there was therefore little change in the stocks of unsold Indian cotton in Bombay on the last day of the season.

The table below, compiled from the East India Cotton Association's returns, gives the comparative figures of stocks for the last five seasons :—

Descriptions.	31st August 1932.	31st August 1931.	31st August 1930.	31st August 1929.	31st August 1928.
Broach	63,043	38,577	31,012	15,053	17,242
Dholleras	49,300	57,559	37,354	40,291	60,336
Oomra	77,874	145,767	239,565	258,790	263,443
Khandesh	52,134	43,244	43,988	57,103	70,238
Bengals	46,272	38,800	28,276	63,121	50,988
Punjab-American	16,279	3,009	775	7,471	13,085
Dharwar	1,657	660	1,951	5,091	4,870
Comptas, Tinnevellys and Cambodia	29,525	37,416	16,785	29,249	44,346
Westerns and Northern	31,130	22,466	9,048	25,486	27,404
Persian	500	..	..	31	190
Americans	16,456	11,838	297	333	2,034
Egyptians	20,082	2,021	..	..	..
East Africans	21,975	32,645	12,293	13,592	9,150
Other sorts	4,836	10,879	10,628	26,363	37,635
Total ..	431,063	444,881	431,972	541,974	600,961

It is seen that the total stocks of unsold cotton on the 31st August 1932 were very nearly the same as on the 31st August 1930 and that there was a very great reduction in the stocks of Oomras.

B. WORK OF THE YEAR.

17. The year under review witnessed the completion of four of the Committee's research schemes, three of them being those that were originally sanctioned in 1923. There were 29 research and other schemes under operation during the year 1931-32 at a cost of Rs. 4,93,840 and their progress has been reviewed in the subsequent chapters of this report. In this chapter are given the stages of development reached in the various legislative and other measures in the introduction of which the Committee has played no mean part in its advisory capacity. Also some of the other important features of the Committee's activities which have not been included in the above categories are briefly touched upon in the following paragraphs.

Reference was made in last year's report to the review of the Committee's work and its research policy. The pamphlet "Cotton Improvement in India," dealing with these points, was circulated to all trade associations in India and to many individuals interested in cotton, and their views were solicited. The several interesting and helpful comments and criticisms thus received were discussed by the Committee at its twenty-fourth meeting held in December 1931, and the tentative conclusions that were arrived at will

be further considered at the next cold weather meeting. The two important questions which the Committee will be called upon to consider, in the words of the President, are :—

- (1) "India is capable of growing its own present mill requirements of long-staple cotton, but will it pay the grower in every case ?
- (2) If staple cotton replaces the short-staple varieties at present grown, what effect will that have on the price of the two commodities ? "

The preliminary work in connection with the proposed investigation into the cost of cultivation of cotton, sugar-cane and their rotation crops in the different parts of India, to be jointly financed by the Imperial Council of Agricultural Research and the Committee, has now been completed and the full scheme formulated by the Joint Committee of these two bodies awaits the approval of the Committee.

The Committee also dealt with certain specific points referred to it by the Tariff Board in connection with its enquiry into the Cotton Textile Industry in India. The Tariff Board's letter and the Committee's reply thereto are given in *Appendix V*. Arising out of the oral evidence tendered to the Tariff Board by the representatives of the Committee, the Committee was further called upon to examine the proposition that the grower of long-staple cotton in India was not realizing adequate price for his cotton. The results of the Committee's enquiry into this matter are contained in the letter sent to the Tariff Board (*Appendix VI*).

THE COTTON TRANSPORT ACT.

18. In 1923, the Government of India, at the request of the Central Cotton Committee, passed the Cotton Transport Act which enables Local Governments to prohibit the import of cotton into any area within their jurisdiction. This Act was devised to prevent the import, for mixing and substitution, of inferior cotton into areas growing superior strains.

19. *BOMBAY*.—There was no change during the year in the seven areas notified in the Bombay Presidency though the position in the Surat area remains still unsettled. The subject was again discussed by the Committee in December 1931 when it was decided that further action should be postponed for another two years till the two cottons, 1027 A.L.F. and 1A, were given thorough tests for yield and spinning quality.

20. No change was made in the protected areas in Baroda, Rajpipla and Chhota Udepur States.

21. *MADRAS*.—No change has taken place in the protected areas. The absence of restriction on the movements of cotton by road and river has resulted in the object of the Cotton Transport Act being partially

defeated, as *Cocanadas* cotton and cotton from the Nizam's Dominions get into the districts of Bellary and Kurnool as also Malabar and Mysore cottons are taken to Tiruppur. The Southern tract is very extensive, comprising no less than 11 districts, and has facilities to grow several varieties of cotton both inferior and superior and to carry them freely from one place to another within the protected area, so that mixing of Cambodia with any inferior cotton is an easy affair. The amalgamation of the Tiruppur and Tinnevely areas has thus reduced the benefits of the Act.

22. *CENTRAL PROVINCES*.—The position of the protected area in the Central Provinces and Berar remained unchanged during the year.

23. *INDORE*.—The Indore Cotton Transport Act was amended during the year under review restricting the scope of the Act to only *Deshi Mewadi* cotton. This was done in view of the representation of the local mills that they could not get readily their supplies of cotton, as according to the practice in the State the mills depend upon the local markets for their requirements of cotton, the bulk of which is brought in country carts from outside the State. The amendment was considered by the Local Sub-Committee in July 1932 which decided not to take any action till more information on the subject was available. The protected area remained the same as in the previous year.

24. *HYDERABAD*.—No change has taken place in the areas protected under the Hyderabad State Cotton Cultivation and Transport Act.

25. *SANGLI*.—The position of Sangli remained the same as in the previous year.

THE COTTON GINNING AND PRESSING FACTORIES ACT (XII OF 1925).

26. There is nothing particular to report. The Act worked smoothly and the few cases of infringement were reported to the authorities concerned.

27. Legislation for the marking of bales is now in force in the following Indian States :—

Alipura, Alwar, Bahawalpur, Baroda, Barwani, Bhavnagar, Bhopal, Bikaner, Bundi, Cambay, Chhota Udepur, Cutch, Datia, Dewas (Junior), Dhar, Dhrangadhra, Faridkot, Gondal, Holkar State (Indore), Hyderabad (The Nizam's Dominions), Idar, Jaipur, Jamkhadi, Jaora, Jasdai, Jhabua, Jhalawar, Jind, Jodhpur, Junagadh, Katosan, Kishangarh, Kolhapur, Kotah, Lakhtar, Limbdi, Malerkotla, Manavadar, Mewar, Miraj (Senior), Morvi, Mudhol, Muli, Mysore, Nabha, Narsingarh, Nawanagar, Patiala, Porbandar, Radhanpur, Rajkot, Rajpipla, Rutlam, Sachin, Sangli, Sardargarh, Savanur, Sayla, Shahpura, Tonk, Wadhwan, Wankaner and Western India States Agency areas.

Weekly cotton press returns are sent by all the above States except :—

Sachin, Bundi, Kotah, Patiala, Dewas (Junior), Kishangarh and Malerkotla.

Gwalior has not yet introduced legislation for the marking of bales. The Committee has been informed that the subject is still under the consideration of the State authorities.

RE-USE OF OLD HOOPS.

28. The question of the re-use of old hoops was considered by the Cotton Ginning and Pressing Factories Sub-Committee and it was decided to draw the attention of all pressing factories to the prevalence of duplicate marks on hoops and to point out to them that stencilling on the hessian is permissible. All Local Governments also were addressed to bring this matter to the notice of the press owners and also to instruct them on the necessity of deleting from the hoops, when they were used more than once, all marks other than their own before the bales were allowed to leave the factory.

LICENSING OF GINNING AND PRESSING FACTORIES.

29. While discussing the subject of the future policy of the Committee at the twenty-fourth meeting of the full Committee several members dwelt on the necessity of licensing the ginning and pressing factories. The Cotton Ginning and Pressing Factories Sub-Committee took the lead of the full Committee and decided at its meeting in February 1932 to obtain the views of the trade associations represented on the Committee before any further action was taken on the subject. The views of the trade bodies have been received and the subject will be considered again.

MALPRACTICES.

30. No cases of malpractice were reported to the Committee during the year.

FINANCE OF THE COTTON CROP AND PRIMARY COTTON MARKETING.

31. The recommendations of the Special Sub-Committee which dealt with the reports on the investigations into the finance of the cotton crop and its marketing were forwarded to the Local Governments concerned and the further steps taken by them during the year to give effect to these recommendations are given below :—

BOMBAY.—The Bill for the standardisation of weights and measures, which was under consideration since last year, has since been passed. The details of the Bill as passed have not yet been received from the Government.

The Registrar of Co-operative Societies, Bombay, has submitted his report recommending the formation of co-operative cotton sale societies and regulated markets in Sind, but due to the present financial stringency the Government of Bombay have decided to temporarily drop the question.

MADRAS.—No further progress has been made with the Bill which was drafted last year for the establishment of regulated markets for commercial crops.

PUNJAB.—The report on the enquiry into the market practices in the Punjab has not yet been received. The question of the establishment of open regulated markets by the Punjab Government will be considered on receipt of the report.

COTTON MARKETS.

32. The year under report has witnessed still further progress in the steps taken to open regulated cotton markets in India.

The Committee, at its meeting in December 1931, considered the first report on the working of the Dhulia Cotton Market and recommended to the Bombay Government that a copy of the report should be sent to every District Local Board and Municipality interested in cotton with a view to acquainting them with the successful establishment of this market. The District Local Board, East Khandesh, has passed a resolution that the Amalner and Jalgaon markets should be brought under the Bombay Cotton Markets Act, 1927, but due to certain difficulties the resolution has not yet been given effect to and the matter is engaging the attention of the Commissioner, Central Division. The question of the establishment of a market at Bijapur is under consideration.

The Madras Presidency has made no further progress with the Bill to provide for the establishment and better regulation of markets for commercial crops.

The Central Provinces Cotton Market Bill, which was introduced in the local Legislative Council by Mr. M. P. Kolhe, a member of this Committee, who is also a member of the Central Provinces Legislative Council, was passed towards the end of August (copy of the Act is given in *Appendix VII*). The draft Bill was approved by the Committee at its December meeting.

A complaint was received from the East India Cotton Association against the high incidence of license fees levied from brokers and *adatyas* in Berar cotton markets under the revised Berar Cotton Market rules. The Committee decided that no recommendation should be made to the Central Provinces Government till the revised rules were given a fair trial. The subject is likely to come for consideration next year again.

In Hyderabad State, the Hyderabad Agricultural Markets Act has been applied to the Jalna, Umri, Latur and Sailu markets in addition to the Nanded market.

The rules for the regulation of cotton marketing in Indore City, which came into force in November 1929, were revised during the year and the revised rules were published in the *Holkar Sirkar Gazette* on 7th March 1932. The important change relates to the increase of the size of the Market Committee with a larger representation to the grower on it.

The Karachi Joint Cotton Committee referred to the Indian Central Cotton Committee for its opinion a proposal to alter the standard for Punjab-American cotton from 6/8" *minimum* to 6/8" *average*. The Local Sub-Committee voted against the change and the Karachi Joint Cotton Committee has agreed to retain the old standard of 6/8" *minimum*.

The question of the adoption of universal standards for Indian cotton was again discussed by the Committee at its monsoon meeting. It was decided to ascertain the views of commercial bodies and agricultural associations and to consider the whole question again at the next cold weather meeting.

POOLS OF COTTON GINNING AND PRESSING FACTORIES.

33. It was mentioned in last year's report that the Governments of Bombay, the Central Provinces and Ajmer-Merwara were carrying on investigations, at the cost of the Committee, into the effects of "pools" of cotton ginning and pressing factories on the rates paid to the grower for his cotton. The reports on the investigations were received from the three Governments and it is seen from them that the rates charged by "pools" for ginning and pressing were distinctly higher than in places where "pools" did not exist. The Committee therefore decided to draw the attention of the Governments concerned to the reports of these investigations and to request them to take any action which they thought necessary to prevent the grower being penalised by "pools."

MADRAS COTTON CONTROL ACT.

34. As stated in last year's report, the Local Sub-Committee made a recommendation to the Madras Government that some of the penalties in the Madras Cotton Control Bill were too severe and that they might be lightened. The full Committee further considered the draft Bill in its December meeting and made a suggestion to the Government that the scope of the Bill might be restricted to *Pulichai* cotton in the Tinnevely area. The recommendations of both the Local Sub-Committee and the full Committee were accepted except that the area was not limited to the Tinnevely tract only. The Act received the assent of the Governor-General in June 1932. A copy of the Act and Notifications and Rules issued thereunder will be found in *Appendix VIII*.

THE BOMBAY COTTON CONTRACTS BILL.*

35. The Committee was asked by the Bombay Government to express its views on the new Cotton Contracts Bill which was intended to take the place of the Cotton Contracts Act of 1922. The Bill provided necessary safeguards for free trading in the Bombay Cotton market from outside interference and was intended to help partly a large number of traders and dealers in Bombay who were anxious to carry on their business in the normal way, and particularly the cotton growers throughout India to obtain the best possible prices for their cotton. After full discussion the Committee recommended that, except under abnormal conditions when the Government should have the option to recognize more than one association, there should ordinarily be only one association and that the clauses relating to the supersession of the Board of Directors by a Board of Control were unnecessary.

PUBLICITY AND PROPAGANDA.

36. The question of giving wide publicity to its work and carrying on propaganda on its behalf has been engaging for some time past the attention of the Committee which at its December meeting decided to create a whole-time appointment of Publicity and Propaganda Officer Mr. R. D. Mihra, M.A. Agri. (Oxon.), Post-Grad. Dip. Agri. (Oxon.), B.Litt Rural Econ. (Oxon.), was selected to fill the post, and he joined duty on the 1st June 1932. He devoted much of his attention during the three months from 1st June to the end of August to the study of the Committee's schemes and issued in addition *communiqués* on the following research schemes :—

1. Punjab Botanical Research Scheme.
2. Punjab Entomological Research Scheme.
3. Gujerat Boll-worm Research Scheme.
4. Gujerat Boll-worm Clean-up Scheme.
5. United Provinces Pink Boll-worm Research Scheme.
6. Sind Physiological Research Scheme.

Besides, a Press *communiqué* embodying the work of the August meeting of the Committee was issued and given wide publicity. Furthermore, number of Press *communiqués*; posters, illustrated bulletins, etc., have been prepared which, when approved by specialists, will be issued in due course.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

37. *THE MEXICAN BOLL-WEEVIL* (*Anthonomus Grandis*)
With a view to prevent the introduction into India, through imported American cotton, of the most serious of all cotton pests, viz., the Mexi

* Since passed into law.

Cotton Boll-Weevil, the Government of India, at the instance of the Indian Central Cotton Committee, has restricted, since 1925, the import of American cotton to a single port, namely Bombay, and only after fumigation with hydrocyanic acid gas. During the year under review 244,695 bales were fumigated at Bombay as against 128,845 bales during the previous year. It is gratifying to be able to record that the rebate of fumigation fees at the rate of 8 annas per bale, referred to in last year's report as having been recommended by the Committee, has since been sanctioned by the Government of India and disbursed to the importers concerned. The Committee has now recommended a rebate of 11 annas per square bale and 7 annas per round bale on all cotton fumigated between the 1st April 1931 and the 31st March 1932. The Government of India issued, in October 1931, a comprehensive notification embodying all the live portions of their previous notifications on the subject of fumigation of American cotton at Bombay (*vide* Government of India Notification No. 1581-Agri., dated the 1st October 1931, in the Department of Education, Health and Lands).

38. *The Red (Sudan) Boll-Worm (Diparopsis Castanea) and other pests.*—The restrictions placed on the import of foreign cotton seed under the Government of India Notification No. 1213-Agri., dated the 27th May 1930, in the Department of Education, Health and Lands, and the entire prohibition of the import of foreign *kapas* (unginned cotton) under the Government of India Notification No. 897-Agri., dated the 24th July 1925, in the Department of Education, Health and Lands, continued in force throughout the year. At its twenty-fifth meeting, the Committee again discussed the present restrictions on the import of foreign cotton seed, and decided that no steps need be taken to raise the permissible maximum quantity of seed, viz. 1 cwt., that could be imported in one consignment.

COTTON STATISTICS.

39. *Cotton forecasts.*—The arrangement introduced in 1930 under which the forecast figures are telegraphed by the Director-General of Commercial Intelligence and Statistics, Calcutta, to the Secretary, Indian Central Cotton Committee, in time to enable the latter to post the figures at the offices of the East India Cotton Association, Bombay, simultaneously with the release of these figures at Calcutta, continued to work in the year under report. The cotton trade of Bombay greatly appreciate this arrangement.

It has all along been the earnest desire of the Committee to explore all avenues which would lead to the improvement of the accuracy of the cotton forecasts compiled and published by Government. The efforts made in the past by the Committee, in close co-operation with the Government Agency responsible for the compilation of forecasts, have brought to light several sources of error in the forecasts. And yet the general impression among the trade, and the compilers of private crop estimates, is that the Government forecasts are unreliable. The Committee, at its twenty-fifth meeting, further

considered the subject, and referred it to the Local Sub-Committee to prepare a reasoned memorandum for consideration at the next meeting.

40. *Raw cotton trade statistics.*—Reference was made in last year's report to the recommendation made by the Committee to the Government of India urging the separation of Kathiawar from the Gujerat trade block in the classification of trade blocks adopted for the purposes of raw cotton trade statistics. This recommendation has since been accepted by the Government of India, and Kathiawar is now being separately shown in these statistics.

The ginned cotton of any particular block goes partly to the pressing factories for pressing into bales and partly into the mills direct for consumption. A part of it is also exported loose and the rest is consumed for domestic purpose. Figures of cotton pressed into bales and loose cotton received in the mills are now available. If, in addition, information regarding net imports and exports of loose cotton also is known, the authorities concerned with the preparation of statistics will be in a position to estimate more accurately the yield of cotton than at present. The Committee has therefore recommended to the Government of India that separate statistics for all loose cotton, exported or imported, should be made available for all such trade blocks as, in the opinion of the Provincial authorities responsible for the compilation of cotton forecasts, are of importance for their purposes.

41. *Imports of American cotton.*—The Committee continued to issue weekly circulars giving the purchases for Indian mills of American cotton, the arrivals and the quantity at sea. Importers and millowners of Bombay again furnished information confidentially regarding their purchases of American cotton, and the Committee once again wishes to record its thanks to them for their valued co-operation.

42. *Demand for various types of Indian cotton.*—Reference has been made elsewhere in this report to the review of the Committee's work and research policy initiated during last year. The Committee while discussing the subject thought it necessary first to obtain sufficient information on the export and mill demand for all types of Indian cotton and the variation, if any, in their demand before any definite policy was laid down. Accordingly in January 1932, all mills and exporters in India were addressed to furnish confidentially information regarding the various types of Indian cotton exported or received in the mills during the seasons 1928-29 to 1930-31. Information is being collected for 1931-32. The Committee greatly appreciates the ready response and the valued co-operation it has received in this enquiry from the millowners and exporters. The export figures thus collected came in very handy to solve a knotty problem presented by the Tariff Board (vide *Appendix VI*).

43. *Cotton consumption.*—The compilation and publication of the monthly statements* (1) of Indian cotton consumed in British Indian mills,

*Appendix IV.

(2) of Indian cotton consumed in mills in Indian States, (3) of loose cotton received in the mills in the major cotton growing provinces, and (4) a consolidated statement of (1) and (2), specially meant for publication in the daily Press, was continued. The usefulness of these figures has been greatly enhanced by the arrangement made with Local Governments in which District Collectors supply the Committee with the monthly cotton consumption statements on or before the tenth day of the succeeding month, thus enabling the Committee to publish the all-India figures a month earlier than before. The Committee's thanks are also due to the Indian States concerned for their co-operation in this matter.

COLLECTION AND SUPPLY OF INFORMATION.

44. As in past years, notes* on the progress made in the Provinces and Indian States in the introduction of improved varieties of cotton, and on the work of the Committee, were contributed to the Bombay Cotton Annual, published by the East India Cotton Association.

45. The system introduced in March 1929 of circulating the more scientific and technical journals between the cotton research institutions financed by the Committee worked satisfactorily during the year. This system prevents the unnecessary duplication of literature purchased out of the Committee's funds, and also affords an opportunity to *most* research workers to peruse literature of a more scientific nature than they normally would.

46. The Committee has again to record its thanks to those private and public institutions which maintain on their free mailing list the name of the Committee. The Committee is particularly indebted to the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, to the Empire Cotton Growing Corporation, the British Cotton Growing Association and the East India Cotton Association for the supply of their publications for distribution to members.

PUBLICATIONS.

47. The following bulletins and reports were published during the year :—

- (1) Application of different systems of Highdraft spinning to mixings of Indian Cottons (Technological Bulletin A19).
- (2) Spinning Tests on mixings of long-staple and short-staple Indian Cottons (Technological Bulletin A20).
- (3) Technological Report on Standard Indian Cottons, 1932 (Technological Bulletin A21).

* Appendix IX.

- (4) Spinning Test Report on samples of Kadi/Viramgam and Tinnevely Cotton, 1930-31 (Technological Circular No. 59).
- (5) Spinning Test Reports on 1931-32 samples of :—
- (a) Dhulia (Khandesh) Cotton (Technological Circular No. 60).
 - (b) Ujjain Cottons (Technological Circular No. 63).
 - (c) Khandesh Cottons (Technological Circular No. 64).
 - (d) Broach (Salar), Bailhongal and Hubli-Kumpta Cottons (Technological Circular No. 69).
 - (e) Jagadia and Kadi Cottons (Technological Circular No. 70).
 - (f) Hubli-Kumpta and Hubli-Upland Cottons (Technological Circular No. 71).
 - (g) C. P. No. 1, Muttia and Berar Cottons (Technological Circular No. 72).
 - (h) Latur and Nanded Cottons (Technological Circular No. 73).
 - (i) Surat and Broach Cottons (Technological Circular No. 74).
 - (j) Punjab-American, Jagadia Farm and Navsari Cottons (Technological Circular No. 75).
 - (k) Dhollera, Westerns and Kumpta Cottons (Technological Circular No. 76).
 - (l) Bijapur and Tinnevely Cottons (Technological Circular No. 77).
 - (m) Upland, Cambodia and Karunganni Cottons (Technological Circular No. 78).
 - (n) Kadi/Viramgam and Khandesh Cottons (Technological Circular No. 79).
 - (o) Kalagin and Bagalkote Cottons (Technological Circular No. 80).
- (6) Technological Reports on 1931-32 samples of :—
- (a) Umri Bani (Technological Circular No. 61).
 - (b) Verum 262 (Akola) (Technological Circular No. 62).
 - (c) Verum 262 (Nagpur) (Technological Circular No. 65).
 - (d) Punjab-American 289-F (Technological Circular No. 66).
 - (e) Punjab-American 4-F (Technological Circular No. 67).
 - (f) Jayawant (Kumpta) (Technological Circular No. 68).

SECRETARY'S TOURS.

48. The Secretary visited, during the year, the following places in connection with the Committee's work :—

Simla (twice), Calcutta, Cawnpore (twice), Nagpur (twice), Akola, Secunderabad, Parbhani, Nasik, Baroda, Indore, Lucknow and Poona.

FINANCIAL.

49. In *Appendix X* will be found a statement showing the Receipts and Expenditure and also the Balance Sheet for the year ending March 31st, 1932. Receipts amounted to Rs. 7,38,805 and expenditure to Rs. 7,99,873 against an estimated expenditure of Rs. 11,00,650. The principal items of saving were under Seed Distribution and Extension Schemes (Rs. 73,353)—several schemes sanctioned were held in abeyance; Technological Research (Rs. 53,063); Research Studentships (Rs. 30,676); Co-ordination of Cotton Research in Bombay (Rs. 19,731); other Bombay Schemes (Rs. 13,639); Madras Pempheres and Physiological Scheme (Rs. 9,415); Punjab Schemes (Rs. 16,103); Central Provinces Scheme (Rs. 13,648) and the Institute of Plant Industry, Indore (Rs. 30,000). In the current year receipts are estimated at Rs. 6,53,500 and expenditure at Rs. 10,52,594. With the new schemes sanctioned during the year the Committee will again be compelled to draw on its savings.

CHAPTER III.

RESEARCH.

50. WITH the passing of the Cotton Cess Act, the Indian Central Cotton Committee was provided with funds which are employed in two ways for the improvement and development of the growing, marketing and manufacture of cotton in India. In the first place, the Committee itself directs the work of the Technological Laboratory at Matunga, Bombay, and secondly, it subsidizes the Departments of Agriculture in Provinces and Indian States for the investigation of specific problems and the extension and distribution of seeds of improved varieties of cotton. In addition, a large sum of money is contributed annually to the Institute of Plant Industry, Indore, which is a Central Research Station for cotton and other agricultural problems.

Under the heading of specific problems are included several schemes of research—botanical, for the purpose of obtaining improved strains of cotton by selection and hybridisation ; physiological, for investigation into the causes of shedding of buds, flowers and bolls ; entomological, for the study of life-history of certain pests and methods of combating them, and mycological, for finding ways of overcoming the loss by *wilt*, etc.

The next important activity of the Committee in the provinces is the extension of improved varieties of cotton which have already been evolved by the Provincial Agricultural Departments and to bring to the notice of growers the results of the Committee's schemes, which have proved successful. It will be realized that this latter phase of the Committee's activities is of considerable importance and it grows in value every year as the schemes now in progress bear fruit.

A modest beginning was made last year in propaganda work in the Surat area to prevent the carry-over of the *Spotted Boll-worm* and during the year under report a special officer was appointed to carry on publicity and propaganda of the Committee's work.

The Local Governments were likewise provided with funds for conducting enquiries into the finance and marketing of cultivators' cotton in primary markets and also for investigating in three provinces into the effect of pools of cotton ginning and pressing factories on prices paid to the growers for their cotton.

The Committee also undertakes the training of workers for the different branches of its activities, and since 1923 no fewer than 38 men have received training in various branches of work with which the Committee is concerned.

TECHNOLOGICAL LABORATORY.

51. The report of the Director, Technological Laboratory, for the year under review will be found in Chapter V of this report. As will be seen, the work of the Laboratory during the year maintained the high level reached in the previous year. The number of lots and samples spun during the year was about the same as last year, and with the present staff and equipment this number appears to represent the maximum which can be tackled by the Laboratory in the course of a year. There was a small decrease in the number of yarns spun but this was due to cutting down the number of counts into which a cotton is spun to a minimum with a view to testing as many samples as possible in a year. The different samples tested fall under four heads: (1) Agricultural samples, (2) Standard Indian cottons, (3) Trade samples, and (4) Technological samples. The agricultural samples consist of the promising strains of new cottons which are being evolved at the different Agricultural Research Stations and comprise the bulk of all samples tested during the year amounting to 53 per cent. as against 65 per cent. of the last year. The decrease was due to late arrivals of samples, the season being late, particularly in the Punjab, Bombay and Berar. The standard Indian cottons are mostly the improved varieties which are introduced by the several Agricultural Departments, and occupy 15 per cent. of the total area sown to all kinds of cotton in India. Eighteen standard cottons were tested during the year and the results of those cottons that were received early in the season were published in the "Technological Reports on Standard Cottons, 1932." Testing of the trade samples was started in 1929-30 in response to the demand that the Laboratory should be made directly useful to the trade also. Twenty-three samples selected by the Standards Committee of the East India Cotton Association, representing the average commercial crop of the year, and 13 samples supplied by mills through the Millowners' Associations of Bombay and Ahmedabad were tested and the results published in two-page Technological Circulars. The results of these tests when available for a number of years will give useful and reliable information as regards improvement or deterioration of any of the varieties tested. The Committee considered the demand from individual mills for testing ordinary mill samples and decided that such samples which have no technological significance should be tested only on payment of Rs. 50 for a full test, Rs. 25 for a fibre and blow-room test and Rs. 15 for a fibre or yarn test of each sample. The technological samples are tested in connection with the technological research on the spinning properties of cottons and their mixings.

The special tests were continued on *Banilla* cotton, the spinning quality of which has deteriorated since it was first introduced in Khandesh by the Agricultural Department, and the results have been embodied in a report which will soon be published.* A number of tests were also carried out for finding out the effects of green stain on *Sind-American*. The green stain appears to be due to the separation in ginning of the green fuzz from

* Since published (Technological Report on *Banilla* Cotton, 1930-32).

the seed. Most of the stain was removed in the form of impurities by the normal treatment in the blow-room and the card-room. The yarns spun from this cotton were slightly greenish. Their strength, however, remained almost unaffected and also the green tint disappeared after bleaching by an ordinary mill process. The spinning tests on mixings of long and short staple cottons, 4F and 289F, 4F and *Mollisoni* and *Karunganni* and *Pulichai* were continued, and the results reveal the extent of harm done to good quality cottons by adulterating them with inferior types. The tests on cotton grown with different waterings, other agricultural operations being the same, show that when the number of irrigations was reduced the length and strength of fibre were adversely affected, and that when the crop was given additional waterings even late in the season these defects were remedied.

Mention was made in last year's report of the tests carried out for finding out the normal moisture content of bales pressed under known conditions of temperature and humidity without extra humidification. The experiment was continued during the year under review on ordinary commercial bales as they were received in Bombay. In view, however, of the importance of these tests to the trade and also of the very interesting results obtained, the experiment on trade bales will be continued for one more year.

INDORE INSTITUTE OF PLANT INDUSTRY.

52. The Annual Report of the Director, Institute of Plant Industry, Indore, for the year 1931-32, is found in *Appendix II*. In 1923 the Committee decided to contribute to the proposed Plant Breeding Institute at Indore which would in return devote itself principally to the investigation of cotton problems, and the Institute was opened in 1924 as a Central Research Institute for cotton. Indore is well suited for investigations of cotton problems, situated as it is in an extensive cotton tract. The cottons of Malwa plateau were at one time well known for their excellent quality but to a large extent they have now been replaced by high-yielding short-staple cottons. The main object of the Institute is therefore to provide a centre of cotton research for the black soil tract of Central India. The programme of work laid down includes the general botany, physiology and genetics of Indian cottons in addition to agricultural investigations connected with cotton cultivation in Central India. Considerable progress has been made in the direction of agronomy, and the cumulative effect of grading, surface drainage, clean cultivation and the application of compost has trebled the yield of cotton on the Institute farm. The methods employed are by no means very expensive and no costly manures are required. The process of converting the waste products into valuable compost, as introduced by Mr. Howard, entails no expenditure beyond manual labour and is therefore well within an easy means of the cultivator to double his manure supply every year. Attempts are now being made to carry these improvements to the contributing States. Selection work has now reached the

stage of comparative trials and it is hoped that Malwa will have an improved strain of cotton within the next two or three years. The botanical survey of cottons grown in India was continued and the study of the root system of the varieties on hand was completed during the year. A number of X-Ray exposures were made on cotton seed, buds, and pollen with a view to induce mutations and the effect of these exposures will be studied on subsequent generations. On the physiological side much work has been done on the relationship and reaction of the cotton plant to its environment in the black soils. A number of prospective agricultural employees were given practical training at the Institute in different subjects for periods varying from one to nine months and a special course of training was arranged for Revenue officials.

The cotton research policy* of the Institute came for special review during the year and it was decided that the Institute should hereafter devote greater attention than hitherto to cotton research.

GRANTS-IN-AID.

53. The Committee carries out its policy of cotton research and seed extension by providing the Provincial Agricultural Departments and the Indian States with necessary funds for extra staff and equipment for investigation of the approved problems. All schemes are first considered and approved by the Agricultural Research Sub-Committee before being sanctioned by the full Committee. The Committee is kept in close touch with the development of work by means of the progress reports submitted every year by the officers in charge of the schemes. In view of the increasing demand for funds for new schemes, the Committee decided, at its August meeting, that all new schemes should first be closely scrutinized by small Sub-Committees before they are referred to the Agricultural Research Sub-Committee for approval.

During the year under review the Committee provided funds for 22 research schemes and also sanctioned three more new schemes which have not yet started work.

The existing research schemes are as follows :—

Madras	3—1	Botanical, 1 Physiological and 1 Entomological and Physiological.
Bombay	6—3	Botanical, 1 Physiological, 1 Entomological (Propaganda) and 1 Mycological.
Sind	1—	Physiological.
Central Provinces ..	1—	Botanical.

* Appendix III,

United Provinces	..	1—Entomological.
Punjab .. ..	..	3—1 Botanical and Physiological and 2 Entomological.
Hyderabad .. ..	..	2—1 Botanical and 1 Cotton Survey.
Indore .. ..	..	1—Botanical and General.
Bikaner .. ..	..	1—Botanical.
Burma .. ..	..	1—Agronomic.
Baroda .. ..	..	2—1 Root-Rot and 1 Comparative Tests between 1027 <i>A.L.F.</i> and 1 <i>A</i> cottons.

The three new schemes for which funds have been allotted and which have not yet started are :—

Bombay .. ..	..	1—Co-ordination of Cotton Research.
Punjab .. ..	..	2—1 Root-Rot and 1 Spraying against White Fly.

During the year under review the Khandesh Cotton Breeding Scheme in the Bombay Presidency was closed down after the sanctioned period. Three other schemes, viz., Surat Physiological, Dharwar Wilt and United Provinces Entomological Schemes, have also completed their respective terms, except that the writing up of their final results has not yet been finished.

SCHEMES IN PROGRESS.

MADRAS PRESIDENCY.

54. *The Madras Herbaceum Scheme* commenced work in 1923. It was extended for two years in 1928 and again for five years from July 1930. The original object of the scheme was to obtain by selection suitable strains from local *Uppam* (*G. herbaceum*) equal to *Karunganni* (*G. indicum*) in yield and spinning quality when grown under similar conditions in black soil tracts of Salem and Coimbatore districts of the Madras Presidency. The rainfall of these districts is precarious, and in years of good rainfall *Karunganni* gives a much higher yield than *Uppam*, while in years of low rainfall the position is reversed, the latter being much the hardier of the two. The cultivator meets the situation by sowing a mixture of the two cottons. The *Karunganni* strains which are being distributed by the Agricultural Department are capable of being spun into 26's standard warp counts, and when it was discovered that none of the *Uppam* strains was ever likely to reach the level of *Karunganni* by pure selection, the Committee sanctioned, in 1930, the extension of the scheme for a further period of five years for obtaining by hybridisation what unit selections failed to achieve. Out of the several selections that were made in 1930-31 from the *F*₂ generation

of a promising cross which was made in the early phase of the scheme between *Indicum* and *Cernuum* and crossed again with an *Uppam* strain, 16 were found as good yielders as *Karunganni* C7 in strip tests and they will all be examined for purity in economic characters. A large number of plants of high yielding quality were also selected for further tests from *F*₂ generation of *Herbaceum* and *Indicum* crosses and *F*₃ generation of *Indicum*, *Cernuum* and *Herbaceum* crosses. The attempt made to induce mutations by X-Ray treatment did not give satisfactory results but the material obtained would be put to further tests.

55. *Fodder Cholan Scheme*.—This scheme was sanctioned for three years in July 1930 and commenced work in January 1931. It aims at an investigation into the harmful effects of fodder *Cholan* (*Andropogon sorghum*) when compared with *Cumbu* (*Pennisetum typhoides*) on the succeeding cotton crop, and the problem is being attacked from the points of soil moisture, soil nitrogen, distribution of *Cholan* and *Cumbu* roots in the soil and the rate of their decomposition. The results obtained during the year are summarised below :—

1. The low yield of cotton in "after-*Cholan*" plots is not due to deficiency of moisture in the soil.

2. There was no difference in yield of cotton when *Cholan* and *Cumbu* were cut for fodder in milk stage. The low yield of cotton after *Cholan* may therefore be due to the ordinary practice of allowing *Cholan* to run into seed.

3. The quantity of nitric nitrogen available in *Cholan* plots, whether cut for fodder or allowed to set seed, was less than in *Cumbu* plots though the total quantity of nitrogen was the same in *Cholan* and *Cumbu* plots.

4. *Cholan* plant produces more weight of roots per unit volume of soil than *Cumbu* plant. *Cholan* roots contain more sugar and decompose less readily than *Cumbu* roots.

56. *The Pempheres and Physiological Scheme* was first sanctioned in 1925 but owing to the difficulty of securing a Physiological Botanist with requisite qualifications and experience it had to be delayed till 1931. The Committee at its meeting in July 1930 finally approved of the revised proposals submitted by the Director of Agriculture, Madras, and, pending the return of the two officers of the Madras Agricultural Department who have been sent to England for training and who will take over charge of the scheme, the preliminary investigations are being carried out under the general supervision of the Cotton Specialist, Coimbatore. The scheme comprises two parts, viz., entomological and physiological. The Entomological part consists of an investigation into the methods of fighting out the Cotton Stem Borer (*Pempheres affinis*), an important pest in the Madras Presidency, while the Physiological part aims at ascertaining the causes

for greater damage by the borer on some cottons than on others. The work of the year throws some light on the relation between the insect and the cotton plant.

BOMBAY PRESIDENCY.

57. *Surat Physiological Scheme.*—This scheme was sanctioned in 1923 and was extended in 1928 for a further period of five years subject to review at the end of three years. The scheme came for consideration in July 1931 when it was decided that it should be closed down at the end of the cotton season 1931-32 and that the year 1932-33 should be devoted to the writing up of the results. The work of the year under report is mainly a repetition of what was done in the previous year and confirms the results already obtained. The important results are summarised below :—

1. The heavy shedding of buds, flowers and bolls is due to the interaction of growth activities and inadequacy of food supply, particularly nitrogen, in the plant.

2. The marked fall of nitrogen in the plant occurs at about the period of the commencement of the usual heavy boll shedding and it remains at that level thereafter till the season is over.

3. The early application of nitrogen in a readily available form increases the vegetative growth and production and retention of buds.

4. The late application of nitrogen causes a larger proportion of flowers to ripen into bolls.

5. The application of nitrogen is not of much consequence under rain-fed conditions except in years of late rains but it is of high economic value when irrigation is possible.

6. Boll shedding is to some extent hereditary.

58. *Surat Boll-worm Propaganda Scheme.*—This scheme is the result of the Surat Entomological Scheme which came to a successful termination in March 1931. The object of the latter scheme was to study the life-histories of the *Spotted Boll-worms* (*Earias fabia* and *insulana*) and to devise means for reducing the loss caused by them. The investigations provided a large amount of useful information, and before the scheme was actually closed down the Committee, with a view to give practical application to the findings of this scheme, sanctioned a new scheme in December 1930 for intensive cleaning up in a selected area of 480 square miles in Gujerat, immediately after harvest, of all cotton stalks and stubbles and for eradication of alternative host plants. The Clean-up Scheme could not, however, be started immediately, due to unfavourable political situation in Gujerat and also due to comparative ignorance of the cultivator of the activities of

the Department of Agriculture in the area where the campaign was to be undertaken. The Committee, therefore, thought it desirable to start propaganda for the purpose of establishing good relations between the Department of Agriculture and the cultivator, and sanctioned the Boll-worm Propaganda Scheme as distinct from the Clean-up Scheme already sanctioned. An intensive propaganda was carried on from April 1931 to the end of January 1932 by means of ocular demonstrations and discussions to convince the cultivator that a substantial increase in yield of *kapas* could be obtained by depriving the boll-worm of its food supply. These measures were very successful and when the Propaganda Scheme merged in February 1932 into the Clean-up Scheme the growers readily purchased as many as 6,815 plant pullers with which 60,000 acres out of a total area of 80,000 acres were dealt with. The remaining area was cleaned by local method and this might give rise to the ratoons being sprouted and the boll-worm being carried over. The results will be seen in the next season.

59. *The Dharwar Wilt Scheme* was started in 1923 for finding out means of checking the spread of *wilt* disease on local cottons in the Gadag area. On failure of this object, the Committee decided, in 1928, that breeding of wilt-resistant strains was the most satisfactory way of overcoming the disease and sanctioned the extension of the scheme for a further period of five years subject to review at the end of three years, for breeding wilt-resistant varieties without altogether giving up the academic side of the investigation. The Cotton Breeder of the Agricultural Department at Dharwar had in hand some promising wilt-resistant strains, one of which a cross, known as *Jayawant*, was finally selected, and its seed is now being distributed by the help of a Seed Distribution Scheme financed by the Committee. *Jayawant* has all the desirable characters of its two parents—*Dharwar 1*, a high yielder though susceptible to *wilt*, and *Dharwar 2*, a wilt-resistant but poor yielder—and has already spread over an area of nearly 140,000 acres. It is hoped that this new wilt-resistant variety will soon cover the entire Gadag tract. The scheme was reviewed in December 1931 and was closed down at the end of May 1932, as recommended by the Conference convened by the Director of Agriculture, Bombay Presidency, in April 1931 to discuss the work done on *wilt* at Dharwar. The summary of the important results is given below :—

1. A strain of the fungus *Fusarium Vasinfectum* Atk is the cause of the *wilt* disease.

2. *Fusarium* fungus is not a single fungus but is split into differentiated physiological forms.

3. The range of temperature within which the *wilt* fungus lives on *agar* medium is 18° C. to 40° C. The disease is most severe at soil temperature 20° C. to 27° C., decreases at 28° C. to 31° C. and is completely checked at 32° C. This discovery is useful for testing new types of cotton for wilt resistance, before they are put in the hands of the grower.

4. The disease is carried in cotton seed.

60. *Khandesh Cotton Breeding Scheme*.—The scheme was started in 1926, extended in 1931 for a period of six months, and closed down in March 1932. The chief object of the scheme was to give a thorough test to a cross known as *Banilla* which had been made some years before by the Agricultural Department. This cotton is superior to local mixture and *N.R.* in ginning percentage and length of staple but there was some doubt about its yield. The work of the past five years and a half shows that under field conditions *Banilla* is as good a yielder as or even a better yielder than *N.R.*, a heavy yielding type, and the proof that this cotton is more paying than other cottons is to be found in its expansion from 40 acres in 1926 to over a lakh of acres in 1930 without the help of the Agricultural Department. The area under this cotton extended to $1\frac{1}{2}$ lakhs of acres in 1931-32.

The Committee sanctioned in December 1930 a Seed Distribution Scheme for this cotton in consideration of its being more remunerative than *N.R.* *Banilla* has, however, two defects, viz., susceptibility to wilt and falling off in spinning capacity from 20's to 14-15's counts since it was first selected. Preliminary work of isolating wilt-resistant, high-yielding types of cotton with good spinning qualities was carried on side by side with the testing of *Banilla* and a few promising strains have already been obtained. These will be further tested at Jalgaon where a Breeding Scheme sanctioned by the Committee was started during the year under report.

61. *Jalgaon Cotton Breeding Scheme* was sanctioned in December 1931 for a period of five years at an annual cost of Rs. 7,000 and it commenced work in April 1932. The object of this scheme is to obtain by breeding a high-yielding, high-ginning, wilt-resistant, good spinning cotton to replace *Banilla*. The Committee supplies funds for the staff and equipment, the Plant Breeder being provided by the Bombay Government.

62. *Broach Cotton Breeding Scheme*.—This scheme also commenced work in April 1932. It was sanctioned in December 1931 for a period of five years at an estimated cost of Rs. 13,000 per annum for the purpose of producing a wilt-resistant cotton of high ginning percentage and good fibre for the newly constituted Nerbudda-Mahi Protected Zone.

63. *The Sind Physiological Scheme* completed the sanctioned period of five years during the year under report, when it was extended for a further period of five years. The scheme consists of physiological investigations into certain problems connected with the dates of sowing, water requirements of the cotton plant, general physiology of the plant under perennial irrigation and effects of *alkaline* salts on the growth of the cotton plant. The work so far done has given several practical results some of which are definitely conclusive while the rest have paved the way for future investigations. The chief results up to date are summarised below :—

1. March 15th to May 15th is the optimum sowing period for cotton under irrigated conditions in Sind. •

2. Due to uncontrollable factors such as rain, water-table, etc., no definite conclusions have yet been arrived at with regard to the quantity of water required by the cotton crop and to the suitable interval between two waterings. A duty of 100 or 37 inches of water in five months with judicious intervals of irrigations according to the stages of plant growth appear to give satisfactory results on average soils

3 Enough nitrogen in a soluble form is available in the soils at the beginning of the growing season and the nitrification is fairly active throughout thereafter but there is actual deficit of available nitrogen at the flowering and bolling stages indicating thereby the advantages of the application of quick-acting nitrogenous manures at the flowering and bolling period.

4. *Punjab-Americans* and *Egyptians* are both capable of high individual yield but the stand of the latter is poor, due to the attack of white ants which seem to be partial to Egyptian cottons.

5. All Egyptian varieties suffer from "Red Leaf" disease.

6. None of the four varieties tested, viz., 27 W.N., *Ashmouni*, *Akala* and 4F., is resistant to the harmful effects of soil alkalinity though 27 W.N. appears to stand better than the rest.

The work on the same lines as hitherto will continue.

CENTRAL PROVINCES.

64. *The Central Provinces Breeding Scheme* commenced work in 1923 and was extended in 1928 for a further period of five years. The main object of the scheme is to obtain a wilt-resistant, high-yielding and superior quality cotton and to ascertain the cause of low yield of cotton in Berar. The Department of Agriculture had begun work on cotton selection some time before the scheme was sanctioned by the Committee and it was therefore possible to obtain much earlier than otherwise a pure strain, *Verum* 262, which is a high-yielding wilt-resistant variety capable of spinning 20's to 22's against 8's to 12's of local *Oomras*. Due to a substantial premium paid for this cotton, a very great demand has sprung up for its seed, which is being widely distributed in the Central Provinces and Berar by the aid of a Seed Distribution Scheme financed by the Committee. Two new high-yielding and wilt-resistant strains of *Verum* 262 have since been isolated and one of them, a late variety, is suitable for standard warp counts upto 30's. It is best suited to localities where the rains extend beyond September, and in these localities it is gradually replacing its parent. The other strain, an early variety, has been selected to meet the demands of the tracts that suffer from early frosts and rapidly drying soils which require an early

maturing variety. Another new strain, No. 438, has proved very satisfactory, and it is also likely to prove superior to *Verum* 262. *Bani E.B.* 31 has again proved satisfactory during the year under report. It is superior to *Bani* 306 by about 5 per cent. in staple length and is capable of spinning standard warp counts upto 41's. The introduction of groundnut in rotation has given very satisfactory results and much attention is therefore being paid to breeding high-yielding varieties of groundnut and also to devising means of lifting groundnut cheaply. The best type, *Akola* No. 10, has consistently given the highest outturn of 2,260 lbs. per acre, and the introduction of a special plough and the method of simultaneous lifting and ploughing have reduced the cost of cultivation by Rs. 5 per acre in addition to the land being ploughed up six months before the sowing season.

UNITED PROVINCES.

65. *The United Provinces Entomological Extension Scheme.*—Mention was made in last year's report that the details of this scheme would be given in this report. The scheme has as its object the control of *Pink Boll-worm* in a selected area of about 4,700 square miles by heat treatment of all cotton seed produced in that area. It requires fitting up every ginning factory in the selected area with a seed heating machine to kill all the larvæ contained in the seed without affecting the vitality of the latter. The scheme entails a recurring expenditure of Rs. 3,35,000 over a period of five years and provision for machinery at an approximate cost of Rs. 6,25,000. The Committee at its meeting held in December 1931 agreed to sanction the scheme provided the United Provinces Government were prepared to bear the cost of machinery and to give an undertaking that they would endeavour to pass any legislation which may be required for proper working of the scheme and that they would extend the scheme to the whole province if it proves a success during the first five years. The Committee's proposals are still pending with the Government of the United Provinces.

PUNJAB.

66. *Botanical Scheme.*—It commenced work in August 1925 and was extended in July 1929 for a further period of five years from the 1st April 1930. The Committee has provided a Cotton Research Botanist and a grant for special staff and equipment in addition to what the Punjab Government provides for the study of the problems connected with cotton grown in the Punjab Canal Colonies where a very large area is cropped with American cotton. Periodic "failures" of this crop both as regards yield and quality made it necessary to start an investigation into the cause and to try and obtain a suitable variety which could replace the 4F cotton now extensively grown. The Botanist in charge produced, after five years' work, a strain which appeared promising but it had to be given up as it proved very susceptible to *Jassid* attack. He had, however, a few *Jassid*-resistant types in hand and attention is now being paid to their tests. One of these types—an early variety—has shown again this year satisfactory resistance

to the pest and efforts are being made to multiply its seed as quickly as possible. The application of quick-acting nitrogenous manures towards the end of August has been found again to give considerable increase of yield. Nitrate of soda could be applied with advantage even a little later.

67. *The Entomological Scheme* started work in 1926 and was extended in 1930 for a further period of two years. The object of this investigation is to ascertain the reason for the difference in the incidence of the *Pink Boll-worm* (*Platyedra gossypiella*) between the South-East Punjab where it is serious and the Canal Colonies, where its damage is negligible. The work of the first four years has definitely proved that temperature is the principal factor in the emergence of the moth and further investigations have shown that humidity also plays an important part in the life-history of the insect. There is therefore little possibility of the *Boll-worm* pest becoming dangerous in the Canal Colonies unless the climatic conditions of the Punjab are changed due to the extension of Canal irrigation. The following is the summary of the important results obtained during the year :—

1. The number of eggs laid by *Pink Boll-worm* increases from July, reaching the maximum in the middle of September to the middle of October.

2. At any constant temperature below 10° C. and above 37° C. the moth failed to lay eggs and the eggs also failed to hatch, the maximum number of eggs being laid at 25° C. constant. The time taken for hatching varies from 17-18 days at a constant temperature of 15° C. to 4 days at 33° C. to 35° C.

3. Larvæ continued to come out of the double seeds for about a month when the seeds containing larvæ were subjected to constant temperatures of 25° C., 27° C., 30° C. and 33° C., and soaked in water for 2-8 hours every week but they all died when the temperature was raised to 36° C.

4. The moths continued to lay eggs at the room temperature (27° C. to 33° C.) so long as the humidity was about 20 per cent. and failed to lay them when the humidity was lowered to 10 per cent. Egg laying was also stopped at a constant temperature of 35° C., when humidity fell below 60 per cent. and exceeded 90 per cent. Hatching did not take place at 33° C. constant when humidity was lowered below 50 per cent.

5. The *Boll-worm* attack is more severe on American cotton than on *desi* cotton.

6. Light traps are effective only when the temperature ranges between 23° C. and 30° C.

68. *White Fly Scheme*.—*White Fly* (*Bemisia gossypiperda*) is a sucking insect that does damage to cotton and other crops. The Department of

Agriculture started work on *White Fly* in 1928, and in 1929 one of the Committee's research scholars was deputed to study the insect at the British Cotton Growing Association's estate, Khanewal, where it was first observed causing damage. The Committee, at its meeting in December 1930, was convinced that the *White Fly* pest was of sufficient importance to justify a more thorough investigation and sanctioned the *White Fly* scheme for a period of three years which commenced work in May 1931. The work of the year under report shows that the *White Fly* attack is more severe on early-sown crop and also on the crop that received low irrigation than on late-sown and heavy watered crop and the yield is inversely proportional to the incidence of attack. One spraying in July or August gave an increase of 1 *maund* and 39 *seers* and 2 *maunds* and 35 *seers* of seed cotton per acre respectively and when the crop was sprayed twice the increase went up to 4 *maunds* per acre. The application of nitrogen in readily available form gave a vigorous growth and counteracted the effects of attack.

69. *White Fly Spraying Scheme*.—This is only supplementary to the *White Fly* Scheme mentioned above, and was sanctioned in August 1932 for a period of one year at a cost of Rs. 11,250. The investigations of the *White Fly* Scheme have already resulted in the discovery of insecticides which would kill the *White Fly* without causing damage to the cotton crop, but the results of the spraying experiments on small areas are misleading as the insects can fly to the sprayed plants from the unsprayed areas. The object of the scheme is therefore to carry on large-scale spraying experiments with different kinds of insecticides for obtaining definite results on the economics of spraying on large areas. The experiments will be carried out to ascertain the following points :—

1. The most suitable and economic insecticide and the proper time for spraying or dusting.
2. The form in which the insecticide should be applied—dust or spray.
3. The various methods and appliances for spraying and dusting the field crops.

70. *The Root-Rot Scheme* was sanctioned in August 1932 for a period of three years at a total cost of Rs. 13,506. *Root-Rot* attacks both American and *desi* cottons, mainly in the Canal-irrigated tracts, and the damage done by it is estimated at Rs. 15,75,000 every year. The investigations carried out by the Botanical section of the Agricultural College Research Institute, Lyallpur, go to show that a fungus of the type of *Fusarium* is present in the affected plants. The disease appears ordinarily in the last week of June when the crop is about two months old and continues up to the middle of September. It spreads in a circle among healthy plants and the affected ones dry up very quickly. It was also observed that the soil of the affected area had a bed of *Kankar* underneath but the death-rate did not decrease when *Kankar* was removed. Some plants escaped the disease while others

close to them were attacked, and seeds of plants which remained unaffected in one year did not produce plants resistant to the disease when sown next year. The problem is proposed to be attacked on the following lines :—

1. Study of the life-history of the organism and the conditions causing the disease.
2. Isolation and inoculation tests of causal organisms, if any, on plants and cultures.
3. Study of the climatic and soil factors influencing the disease.
4. Control measures, remedial and preventive.

BIKANER.

71. *Gang Canal Scheme*.—This scheme started work in January 1931 at Ganganagar. It was sanctioned for five years for the purpose of obtaining by selection and hybridization improved types of Indian and American cottons capable of spinning at least 25's counts. Agronomic problems also will be studied, such as the best rotation for cotton, the improvement of yield by rotation and the correct adjustment of irrigation water. Of the 67 pure types that were tested only eight proved worth further trial. Experiments have been started for finding out the optimum sowing dates and the optimum water requirements and arrangements have also been made to start manurial tests. Most of the American and Egyptian types of cotton that could be had in India have been sown and they will be tested minutely as some of them might prove suitable for this tract. The pure types of *desi* cottons grown in the surrounding provinces have also been sown for comparative tests.

HYDERABAD.

72. *The Botanical Scheme* commenced work in 1929 at Parbhani for the purpose of studying cottons which go to make up *Gaorani* or *Bani* cotton and for the production of pure types of high economic value. *Gaorani* or *Bani* is probably the best of the indigenous cottons from the point of spinning but it is a poor yielder with low ginning percentage. It is therefore being replaced by high-yielding, short-staple *neglectums* which have become of late popular with the grower. It is hoped to obtain, by selection and crossing, high-yielding and high-ginning types with good spinning qualities which would prove more remunerative than short-staple *neglectums*. The Botanist in charge has already secured a few promising selections which are under observations. Selfed seed of *Banilla* cotton enough for ten acres and a fair quantity of *Gaorani* seed, selected by intensive roguing, have been obtained during the year and they will be multiplied for distribution.

73. *Survey Scheme*.—This scheme was sanctioned in December 1930 for a period of four years, as recommended by the Agricultural Research Sub-Committee, for carrying out a detailed survey of the cottons grown in Hyderabad State as an essential preliminary to scientific improvement of the crop and the extension and distribution of the seed of improved varieties. The scheme, as sanctioned, entailed the employment of a whole-time officer to collect plant types from cultivators' fields all over the State and to test them on the Central Farm at Parbhani. The Committee at its meeting in August 1932 sanctioned the appointment of another officer and extended the scheme for one more year as it was considered hardly possible for one officer to complete the work satisfactorily in four years. The study of vegetative and lint characters of plants grown out of the representative samples of cotton seed obtained from Aurangabad and Parbhani districts shows that the crop grown in these districts consists of mainly three types—*G. neglectum*, *G. indicum* and *G. hirsutum*—with a very small percentage of crosses which do not fall under any known variety. These results are confirmed by the survey of the cultivators' crop in a few representative villages.

BURMA.

74. *Cotton Improvement Scheme*.—This scheme was sanctioned in December 1930, for a period of three years, for cotton improvement in Burma, and it started work in April 1931. The Department of Agriculture has in hand three improved varieties of cotton and attempts are being made at Mahlaing to multiply and distribute their seed. Experience has, however, shown that distribution of seed of improved varieties is of little consequence unless the local methods of agriculture are first improved. The object of the scheme is therefore to introduce into general practice the better methods of cultivation such as conservation of moisture in the soil, preservation and utilization of all farm waste as manure, winter ploughing and early preparation of soil, drill sowing and intercultivation. The Committee's funds are being used for recruiting six demonstrators each year, up to a total of 18 in the third year, for demonstrating better methods of agriculture. During the year under report the first batch of six demonstrators were appointed, each in charge of the three different demonstration holdings, and the necessary implements were purchased. The season was particularly unfavourable but yet the work of the year was on the whole satisfactory. On many of the demonstration holdings in Meiktila district the yield of seed cotton went up to 290 lbs. per acre against the average of 95 lbs. for the district while on three of them it yielded at the rate of 365 lbs. per acre.

BARODA.

75. *The Root-Rot Scheme* commenced in Baroda in February 1932. It was sanctioned in July 1931, for a period of two years in the first instance, for investigation into *Root-Rot* which does great damage to cotton in the sandy alluvial soils of Gujerat. The scheme also includes the breeding of suitable strains of cotton resistant to *Root-Rot*, as in the case of *will*.

76. *Scheme for comparative tests between 1027 A.L.F. and 1A cottons.*—

This scheme commenced work in April 1932 and it was sanctioned at a total estimated cost of Rs. 4,280. Early in 1926 the Government of Bombay agreed to the policy of the Department of Agriculture of maintaining only one variety of cotton, viz., 1027 A.L.F., in the whole tract south of the river Nerbudda, and relaxed some of the provisions of the Cotton Transport Act by permitting the transport of cotton by road between the three protected areas, viz., the Surat Zone, South Surat Zone and the Olpad-Ankleshwar Zone, on a definite understanding that in the event of any inferior cotton being introduced in any of these areas the road restrictions would be reimposed. In 1927 the Sonsek group of Co-operative Societies were found distributing the seed of Surat 1A, and wanted to have the freedom to grow this cotton in Ankleshwar area on the plea that while this cotton was nearly as good as 1027 A.L.F. in spinning quality it was much superior to it in yield and ginning percentage. The trade of the locality disagreed with the Co-operative Societies regarding the spinning quality of 1A cotton and maintained that the superior spinning quality claimed for this cotton was due to the fact that it was not a pure cotton but a mixture of 1A and 1027 A.L.F. The Committee therefore thought it desirable to verify, before it could offer its opinion on the matter, the claim of the Sonsek group of Co-operative Societies by means of comparative tests for yield and spinning quality of the two cottons in their pure condition. The Bombay Agricultural Department has undertaken to carry out field tests in the Surat district but as the cotton policy of the Navsari district in Baroda State is the same as in the Surat district, the Committee sanctioned this scheme for similar tests in the Navsari district also.

CHAPTER IV.

SEED EXTENSION SCHEMES.

77. **THE** Indian Central Cotton Committee, at its monsoon meeting in 1929, decided to assist the Agricultural Departments in wider distribution of the seed of improved varieties and sanctioned, during the past two years, twelve seed distribution schemes, of which two have not yet been started. Two more schemes were sanctioned in August 1932.

78. *Madras*.—As stated in last year's report, an irrecoverable grant of Rs. 18,000 over a period of five years was sanctioned for the extension and distribution of the seed of the improved *Cambodia* cotton. The Committee provides the pay of an Agricultural Officer to act as Grader, Adviser and Business Manager to a group of seed societies in the Coimbatore district which grow the selected varieties of *Cambodia* and gin and sell the lint collectively and assist the Agricultural Department in the distribution and extension of the improved seed. About 1,200 acres were sown with pure seed during the year and it is expected that this crop would yield not less than 3,000 bags of pure seed, sufficient to sow 12,000 acres in the next season.

Two new schemes were sanctioned in August 1932 for the distribution of Co. 2 (*Cambodia*) in Coimbatore and Salem districts and H. 1 (*G. herbaceum*) in the Westerns tract at an estimated cost of Rs. 81,310 and Rs. 18,860 respectively. No work has yet been started.

79. *Bombay Presidency*.—Of the seven schemes sanctioned in 1929 and 1930 five were in operation during the year and the remaining two schemes have still been held up pending ways and means of financing the purchase of seed being devised.

80. *Hubli*.—A grant of Rs. 40,800 for a period of five years was sanctioned to the Hubli Cotton Sale Society, Ltd., in the Dharwar district for the distribution and extension of the improved *Jayawant* and *Gadag* 1 cottons. Of the amount of Rs. 8,560 spent during the year Rs. 3,560 went to the Bombay Agricultural Department for roguing, etc., to maintain purity of seed and the balance to the Society for seed distribution. The Society organized a reserved area of 17,640 acres and distributed over 1,100,000 lbs. of pure seed for sowing during the year.

81. *Gadag (Extension and Supplementary)*.—The Gadag scheme is the same as the Hubli scheme, except that the total subsidy including the supplementary grant sanctioned in December 1930 amounts to Rs. 66,323. The total expenditure for the year 1931-32 came to Rs. 12,848 of which Rs. 2,143 went to the Gadag Cotton Sale Society which organized a seed-growing area of 22,200 acres and distributed about 1,245,000 lbs. of pure seed.

82. *Surat*.—This scheme was sanctioned in 1929 for two years and extended for a further period of two years in December 1931. The Committee sanctioned for the year 1931-32 Rs. 2,000 for the pay of a Graduate Assistant and Rs. 5,000 for the opening of seed depots for sale in the Surat tract of the seed of the improved variety known as 1027 *A.L.F.* Twenty-one depots were organized during the year and they dealt with 2,306,525 lbs. of pure seed of which 1,572,060 lbs. went to Rajpipla, Chhota Udepur, Jambughoda and Baroda States.

83. *Khandesh*.—In December 1930 the Committee sanctioned this scheme for a period of five years at an estimated net cost of Rs. 1,60,340 for the extension of *Banilla* cotton in Khandesh area. This cotton, the result of early work by the Bombay Agricultural Department, has been extending rapidly on its own merits in spite of the fact that it is somewhat susceptible to *wilt* and that it has deteriorated in spinning value since it was first tested. The work is in progress to secure a more satisfactory strain, but *Banilla* even as it stands at present is far superior to local varieties and gives better returns. The scheme commenced work in May 1931 and about 135,000 lbs. of pure *Banilla* seed have been produced for multiplication and distribution next year.

84. *Athani*.—In November 1929 the Committee sanctioned this scheme for a period of five years at a total estimated cost of Rs. 39,482 for multiplication and distribution of seed of *Jayawant* in the Athani taluka of the Belgaum district. But the scheme could not be started owing to the difficulty of devising ways and means of financing the purchase of seed. In December 1931 the Committee sanctioned revised proposals put up by the Director of Agriculture, Bombay, amounting to Rs. 46,757 for a period of five years. The scheme commenced work in April 1932.

85. *Haveri and Bailhongal*.—These schemes were sanctioned in 1929, but owing to the difficulty of devising ways and means of financing the purchase of seed they have not yet started work.

86. *Sind*.—A grant of Rs. 93,000, spread over three years, was sanctioned in December 1930 for the extension of improved cottons in the Barrage area in Sind and also for organizing and carrying out demonstrations, comparative tests and propaganda work to facilitate the extension of improved cottons when perennial irrigation becomes available. The methods of cotton cultivation were demonstrated in 15 centres on the right bank of the Indus where cotton has never been established before, and *desi*, 4*F*, 285*F* and 289*F* varieties were compared for yields in nine centres on the left bank of the river. The work of the seed multiplication of the improved *desi* variety and the improved varieties of Punjab-American cotton is in progress.

87. *Central Provinces*.—Rs. 50,359 were sanctioned for one year from the 1st August 1931 to the 31st July 1932 for additional staff to supervise the roguing, collection, ginning and marketing of *Verum* 262 cottons. A

large quantity of pure *Verum* seed, amounting to 3,676,960 lbs., was sold by the Department of Agriculture for sowing in 1931, while in addition 1,457,456 lbs. of reasonably pure seed were distributed extra departmentally. The scheme was again extended in August 1932 for a further period of one year at an estimated cost of Rs. 26,316-8-0.

88. *Hyderabad*.—A grant of Rs. 5,000 for three years was sanctioned for temporary staff to supervise the extension of pure seed in Raichur and Gulbarga districts. 207,500 lbs. of *Jayawant* and 49,170 lbs. of *Gadag No. 1* seed were distributed in 66 villages during the year.

89. *Punjab (erection of ginnery at Lyallpur)*.—At a certain stage in the production and propagation of new types of cottons, an experimental ginnery becomes a necessary adjunct of a cotton research station to deal with the large number of cottons from the experimental plots there and to ensure proper supervision of ginning operations. Such a stage having been reached at Lyallpur, the Committee in July 1930 sanctioned a sum of Rs. 18,125 for the erection of the ginnery. The erection of building and the machinery was completed during the year under report and a trial run of the machines was also made which were found to be in perfect working order. Full advantage of the ginnery will be taken hereafter.

RESEARCH STUDENTS.

90. One more important function which the Committee is performing is the training of research workers in several of the sciences pertaining to cotton. Distinguished graduates of science from Indian Universities are placed under the guidance of experienced investigators working on the Committee's schemes, at the Institute of Plant Industry, Indore, or in the Committee's Technological Laboratory. The scholarships are usually held for a period of two years but extensions are frequently given. Fifty students have been given scholarships of whom six are still under training, six resigned before completing their training, and twenty-eight have been taken on the Committee's staff or have joined Provincial or State Agricultural Departments. During the year under report one of the Committee's ex-research students was awarded a foreign scholarship, but no research scholarship was granted for training in India. Two students completed their training during the year and reverted to their appointments in the Provincial Agricultural Department from where they were selected. Expenditure under this head during the nine years ending the 31st August 1932 amounted to Rs. 1,99,680-10-9.

P. H. RAMA REDDI,
Officiating Secretary.

CHAPTER V.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, 1931-32.

INTRODUCTION.

THE present report contains an account of the work done at the Technological Laboratory from 1st September 1931 to 31st August 1932. It will be seen from a perusal of this report that the testing of agricultural and trade samples was maintained at the high level achieved in 1931 and that good progress has also been made in the research activities of the Laboratory. Experiments in connection with several items of research approved by the Committee were concluded and their results have either been published in Technological Bulletins or are in the course of preparation. Principal amongst these must be mentioned the completion of the work relating to the determination of the moisture content in bales of different trade descriptions and the variation in the weight of bales of cotton stored in a godown at the Cotton Exchange Building, Sewri, under ordinary conditions of humidity prevailing in Bombay in the course of a year.

The work done at the Laboratory will now be described under the following five heads :—

- I. Spinning Laboratory.
- II. Research Laboratory.
- III. Moisture Testing Section.
- IV. Publications.
- V. General.

I. SPINNING LABORATORY.

The following statement gives a summary of the samples of different cottons tested during the period under review together with the names of the Agricultural Officers from whom these were received :—

BOMBAY.

- (1) *The Cotton Superintendent, S.M.C., Dharwar.*—2 samples of Kumpta Galgalli and Kumpta Jamkhandi ; 11 samples of Kumpta grown in different districts.
- (2) *The Cotton Breeder, S.M.C., Dharwar.*—9 samples of Dharwar, Jayawant and other strains.

- (3) *The Cotton Breeder, Khandesh, Dhulia*.—12 samples of Banilla, N. R. and Local cottons grown in different districts.
- (4) *The Graduate Assistant, Hubli*.—3 samples of Jayawant cottons of different generations.
- (5) *The Professor of Agriculture, Agricultural College, Poona* —4 samples of N.R. cotton for manure experiments.
- (6) *The Botanist in Sind, Sakrand*.—11 samples of different strains grown at the Agricultural Research Station, Sakrand.
- (7) *The Cotton Supervisor, Indus Left Bank, Mirpurkas (Sind)*.—2 samples of green-stained Sind-American cottons.
- (8) *The Cotton Breeder, South Gujarat, Surat*.—3 samples, one each of Surat 5¹, White Flower and 1A Long Boll.
- (9) *The Cotton Physiologist, Surat*.—4 samples of 1027 A.L.F. cottons.
- (10) *The Superintendent, Agricultural Research Station, Surat*.—5 samples of 1027 A.L.F. and other selections.
- (11) *The Cotton Breeder, North Gujarat, Viramgam*.—3 samples of Wagad Local and selections.

PUNJAB.

- (1) *The Cotton Research Botanist, Lyallpur*.—23 samples of *desi* varietal tests, American varietal tests and 4F and 289F mixtures of different percentages ; 13 samples of P.A. 4F, P.A. 289F and other strains and 6 samples of P.A. 4F for watering experiments.
- (2) *The B.C.G.A. (Punjab), Ltd., Khanewal*.—2 samples of P.A. 289F and M.P. cottons.

UNITED PROVINCES.

- (1) *The Assistant Economic Botanist, Cawnpore*.—7 samples of C. 402, C. 520 including a control sample.

MADRAS.

- (1) *The Cotton Specialist, Coimbatore*.—2 samples of IXC 108 and IXC 109 and 2 samples of strains 67 and 75.
- (2) *The Agricultural Demonstrator, Tiruppur*.—One sample of Cambodia Co. 2.

- (3) *The Agricultural Demonstrator, Nandyal*.—One sample of Nandyal 14.
- (4) *The Farm Manager, Nandyal*.—One sample of Cambodia Co. 2 grown at Nandyal and 3 samples of different strains.
- (5) *The Cotton Assistant, Agricultural Research Station, Guntur*.—4 samples of strains Nos. 171, 43, 45 and 49.
- (6) *The Superintendent, Agricultural Research Station, Koilpati*.—One sample of Cambodia Co. 2.

CENTRAL PROVINCES.

- (1) *The Economic Botanist to Government, Nagpur*.—3 samples of Late Verum, Bani 306 and Bani 31.

MISCELLANEOUS.

- (1) *The Cotton Research Botanist, Parbhani (Hyderabad)*.—7 samples of Gaorani, Bani, BXXI, etc., and 7 samples of Bani, Verum and other strains.
- (2) *The Agricultural Officer, Port Blair, Andamans*.—One sample of Sea Island cotton.
- (3) *The Superintendent, Agricultural Station, Jagudan (Baroda State)*.—2 samples of Wagad cottons.
- (4) *The Crop Botanist, Malwa Division, Ujjain*.—6 samples of K. 22, Malvi, G. 16, Cambodia and other strains.
- (5) *The Director, Institute of Plant Industry, Indore*.—10 samples of Malvi, Bani, Roseum and other selections grown at the Institute's Farm, Indore.

It was mentioned in my last Annual Report that the Indian States were now coming forward to avail of the facilities for testing promising strains offered by the Laboratory. This feature will be borne out by the above statement from which it will be seen that among others, Hyderabad, Baroda and Ujjain sent a number of samples for tests. The desire on the part of the Indian States to adopt accurate methods of determining the promising strains with a view to assisting the cotton breeder in his selection work is further shown by the fact that during the year under review one of them, Ujjain, asked for and received assistance from the Laboratory in the matter of opening a small fibre-testing laboratory near its agricultural farm. For this purpose testing instruments of a simple nature were prepared at the Laboratory workshop. These together with full particulars and specifications of more complicated apparatus and working instructions for

all were supplied to the Crop Botanist, Ujjain. This is a step in the right direction, and it is to be hoped that other States will follow suit so that before long a chain of small fibre-testing laboratories will be established all over the country.

The increase in the work of the Technological Laboratory from year to year is shown in the following Tables which give the distribution of samples, lots and yarns spun since 1924-25.

TABLE I.—*Distribution of Samples Spun, 1924-32.*

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	Totals, 1924-32
Bombay ..	18	26	22	22	28	66	89	69	340
Punjab ..	14	1	..	..	42	30	10	44	141
U n i t e d Provinces ..	7	..	6	11	9	7	16	7	63
Madras ..	2	19	50	23	30	51	66	15	256
C e n t r a l Provinces ..	2	..	3	2	2	5	3	3	20
Miscellaneous	3	11	..	6	6	27	28	33	114
Total ..	46	57	81	64	117	186	212	171	934
Standard Cot- ton tests ..	8	54	49	64	33	34	27	18	287
Trade tests and special tests ..	..	..	..	..	..	37	89	134	260
Total tests ..	54	111	130	128	150	257	328	323	1,481

TABLE II.—*Distribution of Lots Spun, 1924-32.*

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	Totals, 1924-32
Bombay ..	36	52	44	44	53	107	90	69	495
Punjab ..	26	4	..	..	83	41	10	44	208
U n i t e d Provinces ..	14	..	12	22	18	14	16	7	103
Madras ..	4	38	100	46	60	85	66	16	415
C e n t r a l Provinces ..	3	..	6	4	4	10	4	3	34
Miscellaneous ..	3	22	..	12	9	33	29	33	141
Total ..	86	116	162	128	227	290	215	172	1,396
Standard Cotton tests ..	34	176	142	178	68	64	54	36	752
Trade and special tests ..	..	..	..	..	..	37	119	186	342
Total tests ..	120	292	304	306	295	391	388	394	2,490

TABLE III.—*Distribution of Yarns Spun, 1924-32.*

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	Totals. 1924-32
Bombay ..	103	152	132	132	159	322	253	203	1,456
Punjab ..	106	14	..	..	254	113	31	136	654
U n i t e d Provinces ..	27	..	36	66	51	42	40	22	287
Madras ..	12	108	278	138	180	255	199	53	1,223
C e n t r a l Provinces ..	8	..	18	12	12	30	12	9	101
Miscellaneous ..	3	58	..	36	27	99	100	93	416
Total ..	259	332	464	384	686	861	635	516	4,137
Standard Cotton tests.	95	514	423	447	290	223	309	136	2,437
Trade and special tests.	..	..	..	..	..	80	343	502	925
Total tests ..	354	846	887	831	976	1,161	1,287	1,154	7,499

It will be seen that the number of samples spun during 1931-32 is practically the same as in 1930-31 while the number of lots shows a small increase. With the present equipment and staff this number must be taken to represent very nearly the maximum which can be tackled in the course of a year. The number of yarns spun during the current year shows a small decrease which is due to the measures adopted last year to meet the growing demand on the resources of the Laboratory. This consists primarily in cutting down the number of counts into which a cotton is spun to a minimum number with a view to testing as many samples as possible. It will also be seen that the number of agricultural samples spun shows a small decrease as compared with similar samples spun in 1930-31. This is simply due to the cotton crop of 1931-32 being late in several provinces, notably in the Punjab, Bombay and Berar.

Advantage was taken of the comparatively late arrival of agricultural samples by putting through as large a number of technological samples as possible which consequently shows an increase as compared with the last year's figure.

The following Table shows the staff employed in the Technological Laboratory from year to year since 1924 :—

As at August 31st in	1924	1925	1926	1927	1928	1929	1930	1931	1932
Technical staff ..	8	11	20	24	27	27	32	32	32
Research students ..	1	3	6	4	3	2	1	1	..
Fumigation chemists ..	..	..	2	4	2	2	2	2	2
Totals ..	9	14	28	32	32	31	35	35	34

The staff shown above consists partly of Research Assistants who are engaged on various research problems and partly Junior Testers who perform the routine work involved in the testing of different samples of cotton. As is well known, these samples are subjected to a thorough test both for their fibre-properties and yarn characteristics which consist of the determination of fibre-length and fibre-weight on the one hand and lea test, single-thread test, actual counts, actual twist, yarn neppiness and yarn evenness on the other. An idea of the total number of tests made in connection with these samples may be had from the fact that in 1931-32 the yarn tests alone amounted to nearly half a million.

Classification of Samples.

It will be seen from Tables I to III that the different samples tested at the Laboratory fall under one of the following four heads :—

- (a) Agricultural samples.
- (b) Standard cottons.
- (c) Trade samples.
- (d) Technological samples.

(a) *Agricultural samples*—The agricultural samples are received from the agricultural officers and cotton breeders, and consist mostly of new and promising strains which are being evolved at the different experimental farms and for which a reliable estimate of their spinning performance is required to enable the breeder to decide at as early a date as possible whether or not they are worth further trials. Besides these, agricultural samples are received in connection with different physiological or botanical experiments such as the effect on fibre-properties and spinning performance, incidence of pests, different applications of water, different dates of sowing, etc. These samples form the bulk of all the samples tested at the Laboratory, and during the period under review their percentage was 53. The results of tests on these samples are embodied in spinning test reports, copies of which, although not published for general information, are supplied to the officers concerned and to the Provincial Agricultural Department in which these officers are working.

(b) *Standard Indian cottons*.—The standard Indian cottons are mostly improved varieties which have been introduced from time to time into general cultivation and which now cover about 15 per cent. of the total area of cultivation under cotton. During the year under review tests were made on the following standard Indian cottons :—

- (1) Jayawant (Kumpta).
- (2) Gadag 1 (Dharwar-American).
- (3) Surat 1027 A.L.F.
- (4) Wagad 8 (Dholleras).
- (5) Punjab-American 4F.

- (6) Punjab-American 289F.
- (7) Mollisoni (Bengals).
- (8) Aligarh A. 19 (Bengals).
- (9) Cawnpore K. 22.
- (10) Cawnpore-American C.A. 9.
- (11) (a) Verum 262 (Nagpur).
- (b) Verum 262 (Akola).
- (12) Umri Bani.
- (13) Cambodia Co. 2 (Cambodia 440).
- (14) Nandyal 14 (Northerns).
- (15) Hagari 1 (Westerns).
- (16) Hagari 25 (Westerns).
- (17) Karunganni C. 7.
- (18) American cottons.

It may be mentioned here that three cottons, viz., Dharwar 1, J.N. 1 and Cambodia Co. 1 have been deleted from the list of the standard cottons. Dharwar 1 has now been completely replaced by the improved variety Jayawant which gives practically the same spinning performance but being much less susceptible to wilt, makes a better stand in the field and gives a higher yield; Cambodia Co. 1 has been replaced by Cambodia Co. 2 which has the same spinning performance but possesses a higher yield per acre as shown by field trials extending over several seasons. J. N. 1 has failed to appeal to the cultivator and has practically gone out of cultivation. It was realized that no useful purpose would be served in continuing tests on cottons which have either gone out of general cultivation or have been replaced by varieties which are capable of giving better monetary return to the grower.

I may also mention here that as American cottons reported upon annually in the Bulletin on Standard Indian Cottons were tested some 6 or 7 seasons ago, it was thought desirable to make fresh tests on the present-day American cotton. Messrs. E. D. Sassoon & Co. very kindly supplied samples of Low Middling and Middling cottons of 1930-31 crop for this purpose and the results of tests on these samples have been incorporated in the bulletin.

Some of these standard cottons are received fairly early in the season and the results of tests on such standard cottons were published at once in four-page Technological Circulars. These were later embodied in the "Technological Reports on Standard Indian cottons, 1932." In the year under review, four-page Technological Circulars were published on the following standard Indian cottons :—

- (1) Umri Bani.
- (2) Verum 262 (Akola).
- (3) Verum 262 (Nagpur).

- (4) P.A. 289F.
- (5) P.A. 4F.
- (6) Jayawant (Kumpta).

The results of tests on these cottons are published in an annual bulletin entitled "Technological Reports on Standard Indian Cottons." Last year the results of a new test, called the 'Ballistic work of rupture,' were introduced for the first time in this bulletin. This year a new statistic, called 'fibre-length irregularity,' has been introduced for the first time, and its values have been calculated for the standard Indian cottons of three seasons. This has been done with a view to giving a physical measurement of the property of lint which is very important to the practical spinner, viz., the percentage of short hairs present in a cotton which, unless extracted as waste in the opening and cleaning processes, cause irregularity in the structure of yarn, thereby reducing its breaking strength. It is hoped that the insertion of this new statistic, defining an important property of a cotton, will prove useful to the practical spinner. The detailed method of calculating this statistic from fibre-length distribution results will soon be described in a separate bulletin.

(c) *Trade samples.*—Testing of trade samples was first undertaken in 1929-30 in response to the demand that the work of the Laboratory should be made more directly useful to the trade. A list of representative Indian cottons was drawn up, some of which were to be supplied by the East India Cotton Association and the others by the Bombay and Ahmedabad mills through their Associations. The samples supplied by the East India Cotton Association are approved by their Standards Committee, who also make a valuation report on these samples before sending them to the Laboratory. It follows, therefore, that the results of these tests, when available for a number of seasons, will give very useful and reliable information as regards the improvement or deterioration of any of these types. The results of tests on these trade samples are published, with the minimum possible delay, in the form of two-page Technological Circulars which are widely distributed to the trade. The following statement gives the descriptions of trade samples received for tests from these sources :—

Cottons supplied by the East India Cotton Association.

- | | |
|--------------------------|--------------------------|
| 1. C. P. No. 1. | 13. Kalagin. |
| 2. Berar. | 14. Kadi-Viramgam. |
| 3. Khandesh. | 15. Westerns (Jhavaria). |
| 4. Nanded. | 16. Farm Westerns. |
| 5. Latur. | 17. Coompta. |
| 6. Muttia. | 18. Upland (Gadag). |
| 7. Punjab-American. | 19. Bijapore. |
| 8. Broach. | 20. Bagalkote. |
| 9. Jagadia Farm. | 21. Cambodias. |
| 10. Surat. | 22. Tinnevely. |
| 11. Navsari. | 23. Karungannis. |
| 12. Dholleras (Wagadia). | |

Cottons received in accordance with the arrangement made with the Millowners' Associations of Bombay and Ahmedabad.

(a) *Bombay.*

- | | |
|-----------------------------|-----------------------|
| 1. Hubli Coompta. | 7. Ujjain. |
| 2. Hubli Upland. | 8. Dhulia (Khandesh). |
| 3. Sujalpur (Ujjain). | 9. Hubli Coompta. |
| 4. Ranala (Khandesh). | 10. Bailhongal. |
| 5. Yawal (Khandesh). | 11. Broach (Salar). |
| 6. Nimbora Farm (Khandesh). | |

(b) *Ahmedabad.*

- | | |
|-------------|----------|
| 1. Jagadia. | 2. Kadi. |
|-------------|----------|

A list of the Technological Circulars published on these samples will be found under "Publications."

Besides the samples which were received in accordance with the arrangement entered into between the Indian Central Cotton Committee on the one hand and the East India Cotton Association and the Bombay and Ahmedabad Millowners' Associations on the other, two samples which possessed special features deserve to be mentioned.

One of these, submitted by a Bombay mill, was of a fairly good quality but it suffered very badly from stringiness. It contained an unusually large proportion of matted fibres. It was concluded from its general appearance and its behaviour in the blow-room that this defect was due to careless and defective ginning, which raised its waste losses and lowered its spinning performance. It was subjected to a thorough test in the spinning laboratory and in the end it was found that by suitably changing some of the settings it was possible to reduce its waste losses and obtain stronger yarns.

The second sample, received from another Bombay mill, was of Punjab-American cotton and suffered very badly from the defect of neppiness. This sample was also subjected to special tests with a view to ascertaining if by suitably changing the settings less neppy yarns could be obtained from it. It was found that in this particular case neppiness was inherent in the cotton itself and that such changes in settings as are ordinarily recommended for dealing with neppy cottons failed to produce any appreciable effect on the quality of yarns.

Mention may also be made of a sample of spindle banding manufactured from a high grade cotton at one of the Ahmedabad mills, which was sent to the Laboratory for comparative tests. This banding was examined for strength and durability, and its behaviour under working conditions was compared with the banding which is ordinarily used in the ring frames of

the Technological Laboratory. A detailed report embodying the results of these observations and containing some suggestions for improvement was sent to the mill concerned.

These three tests are of special importance since they show that as confidence of the trade and the industry in the work of the Laboratory is steadily increasing they have now begun to refer their difficulties to us. The Technological Laboratory has on its staff men who are qualified both for the scientific examination of the cotton fibre and the study of its behaviour in spinning processes and who, compatible with their other duties, are always willing to give such assistance and help to the industry as lies in their power. It may not be possible for them to find a solution in each and every case but even the attempt at the solution of such difficulties will very often prove a point of scientific importance and if at any time positive results are achieved they should be of great value and material help to the industry.

It may be mentioned here that the demand for testing ordinary mill samples was increasing to the extent of interfering with the normal activities of the Laboratory, and the Committee decided that such samples which have no special technological significance would only be tested on payment of a fee. The scale of fees fixed for such tests is as follows :—

For a full test	per sample Rs. 50.
For a fibre and blow-room test	Rs. 25.
For a fibre or yarn test	Rs. 15.

(d) *Technological samples.*—These samples are tested in connection with the technological research on the spinning properties of cottons and their mixings and the influence of mechanical processes on the quality of yarn and their testing is undertaken alongside of the agricultural and trade samples, as opportunity permits.

The following Table contains a statement of the various reports, embodying the results of tests on these samples, issued during the period under review together with the corresponding figures for the previous years since 1924-25 :—

—	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32
Spinning Test Reports.	7	19	19	22	21	63	92	60
Fibre Test Reports ..	1	1	5	1	7	4	7	19
Yarn Test Reports ..	..	..	..	1	4	4	2	3
Totals ..	8	20	24	24	32	71	101	82

It will be seen that the number of spinning test reports shows a small decrease which is principally due to the late arrival of samples, as explained above. The number of fibre test reports, on the other hand, shows a large increase which is due to the receipt of many more samples for fibre tests as compared with the previous seasons.

Special agricultural tests.—It was mentioned in my last Annual Report that a number of tests were made on samples of Banilla cotton grown in the Districts with a view to ascertaining the average performance of the present-day crop of this cotton. In view of the importance, both to the Agricultural Department and to the trade, of the results of these tests, it was decided to repeat them in the following year. This year comparatively few samples of Banilla cotton, grown in the Districts, were received; but, as they gave very similar results to those received last year, the results of all the tests were embodied in one report which is in the press.

Another series of interesting tests were those made on green-stained Sind-American cotton, samples of which were supplied by the Chief Agricultural Officer, Sind. It was found that Sind-American cotton, grown in the Jamrao Canal areas, has lately suffered from a decline in price owing to the appearance of green stain which was apparently due to the removal in ginning of green fuzz from its seed. A number of tests were made on samples of this cotton with a view to finding out whether, and to what extent, the presence of this green stain affects the spinning performance of this cotton. As a result of these tests it was found that most of the green stain was removed in the form of impurities by the normal treatment in the blow-room and the card-room, that although yarns spun from it were slightly greenish in shade as compared with those obtained from an unstained sample, after bleaching them with the ordinary treatment employed by a mill no trace of the green tint was left, the yarns from the stained and unstained samples becoming, in fact, indistinguishable. The strength of yarns spun from the green-stained-sample was very nearly equal to that of yarns spun from the unstained sample. The bleaching was done through the courtesy of Messrs. Tata Sons, Ltd., at one of their mills. It will be seen from the above conclusions that the mere presence of green stain did not produce any serious defect in the cotton itself either as regards its spinning performance or as regards the colour of its yarns which could be bleached satisfactorily to whiteness by the ordinary bleaching process employed by a mill. As it was realized that the results of these experiments were of paramount importance to the cotton growers, the Committee decided to give them wide publicity by publishing them in the form of a leaflet.

Spinning tests on mixings of long-staple and short-staple Indian cottons.—Tests on mixings of Indian cottons, undertaken from time to time at the Technological Laboratory, have revealed some very interesting features. A bulletin describing the results of tests on various mixings made from Punjab-American 4F, Punjab-American 289F, Mollisoni, and Karunganni and Pulichai cottons was published during the period under review,

and a summary of it will be found under "Publications." Further samples of mixings of 4F and 289F, 4F and Mollisoni and Karunganni and Pulichai have been received and tested. The results of these experiments revealed the considerable harm done to good quality cottons by adulterating them with inferior types. These were regarded so important, both to the cultivators and the trade, that the Indian Central Cotton Committee decided to give them wide publicity by publishing their summary in the form of a leaflet.

Tests on samples of cotton grown with different applications of water.—The Cotton Research Botanist, Lyallpur, supplied samples of 4F cotton which were grown under similar conditions except that they had been given different applications of water. These samples were subjected to a very thorough examination, which, besides the usual fibre and yarn tests, included an examination of the samples for percentage of mature hairs. These tests were made with the object of throwing some light if possible upon the vexed problem of the occasional failure of the cotton crop in the Punjab. It was found, as a result of these experiments, that reduced rate of watering affected both the length and maturity of the fibres in an adverse manner, but that these defects could be remedied if the cotton was given a few additional waterings, even late in the season. The Committee agreed to the suggestion made by the writer that further tests on samples of cottons grown under similar conditions but with different applications of water should be made and that the Directors of Agriculture in different Provinces should be asked to supply such samples, if suitable irrigation facilities were available.

TECHNOLOGICAL WORK.

High draft spinning.—The second series of tests relating to the application of high draft spinning to mixings of Indian cottons using the ordinary system and three systems of high draft spinning were completed some time ago. The results of these tests have now been published in Technological Bulletin, Series A, No. 19, a summary of which will be found under "Publications."

Combing of good quality Indian cottons.—One item of research in the programme of future work approved by the Committee related to the combing of good quality Indian cottons with a view to ascertaining their maximum spinning performance under these conditions. The experimental part of this work has now been completed on four Indian cottons, viz., Punjab-American 289F, Cambodia Co. 1, Surat 1027 A.L.F. and Nandyal 14. These cottons were combed to the extent of 20 per cent. and 30 per cent. respectively (1027 A.L.F. was combed to the extent of 26 instead of 30 per cent.). Yarns were spun both from the carded and combed slivers on the ordinary system as well as a four-roller high draft system. The comber waste, in each case, was mixed with a suitable low grade Indian cotton, and the mixings spun into appropriate counts with the object of taking into consideration the economic side of the problem. The results of these experiments are now being written up and will be published in the form of a bulletin.

Settings and Twists in the Fly Frames.—Another item of the programme approved by the Committee related to the effect of different settings and twists on the quality of yarns spun from a cotton. This work has now been completed on three Indian cottons, viz., K22, 4F, and 1027 A.L.F. The results of this work will be described in a bulletin, the preparation of which will be undertaken after the bulletin on Combing of Good quality Indian Cottons is published.

Tests on mode of ginning in relation to the yarn neppiness.—Neppiness in cotton has always been a source of considerable trouble to the industry and the problem of its origin has been attacked from different angles from time to time. It will be remembered that a microscopic examination of the cotton hairs was undertaken with the object of finding out any possible relationship between the neppiness of a cotton and maturity count. In order to supplement this work, it was regarded necessary to perform spinning tests on samples of the same cotton ginned in a roller gin and a saw gin. Two small gins for this purpose were acquired for the Laboratory. These are now being erected, and the experiments in connection with this work are being undertaken on the following cottons for which sufficient quantity of *kapas* has been obtained:—

Gadag 1, Jayawant, Banilla, Verum (Nagpur), Punjab-American 289F, Sind-American 285F, Surat 1027 A L.F., and Cambodia Co.1.

The tests will include an examination of the effects of roller speeds and breast-plate settings so that along with the main problem information may also be made available as to the speeds and settings which are most suitable for ginning different varieties of Indian cotton.

Carding problems.—The extensive investigation on the effect of different settings of the card on the quality of yarns spun is in progress. Alongside of tests on the strength, extension, irregularity, etc., of yarns, a large number of tests are being made on representative samples of fibres obtained from the flat strips, sliver, fly, etc., with each setting. This work is in progress.

II. RESEARCH LABORATORY.

Fibre Testing Section.—Members of the staff deputed to this section have been kept fully occupied with the testing of agricultural samples for their fibre-properties. As is well known, these tests consist of determination of mean fibre-length by two independent methods, fibre-length distribution and fibre-weight per inch for the non-standard cottons and additional tests on fibre-strength, fibre-rigidity, convolutions, and ribbon-width for the standard cottons. In addition to these, numerous tests have been made on samples obtained from card slivers, flat strips and fly in connection with the technological work on carding problems, to which a reference has been made above, and on carded and combed slivers in connection with the work on the combing of good-quality Indian cottons. Furthermore, a fairly large number

of tests have also been made on small size samples received for fibre tests only from different sources. The following statement shows the samples tested for fibre-properties only together with the names of the officers by whom these were submitted :—

- (1) *The Director of Agriculture, Baroda State, Baroda.*—One sample of Kadio (Amereli) cotton.
- (2) *The Cotton Breeder, South Gujarat, Surat.*—3 samples of cross strains.
- (3) *The Cotton Research Botanist, Parbhani, Hyderabad.*—10 samples of Gaorani, 2 samples of Parbhani 21 and Havri 3, 2 samples of Hyderabad-American and 5 samples of Hyderabad-Egyptian cottons.
- (4) *The Assistant Botanist, Hriyur, Mysore State.*—One sample of *G. Arboreum* x *G. Herbaceum* (149-152) strain.
- (5) *The Bharatkhand Textile Manufacturing Co, Ltd, Ahmedabad*—2 samples of Egyptian strains grown at Ahmedabad
- (6) *C. Morgan Esq, Calcutta* (through the Department of Education, Health and Lands, Simla)—4 samples of Sea Island and other cottons resembling Peruvian.
- (7) *The East India Cotton Association, Ltd., Bombay.*—30 samples of A.R. Kampala, A R. Busoga and A.R. Jinja cottons.

The total number of such samples tested for fibre-properties only during the year under review was 60, which shows a large increase over the previous year's figures for such tests. Amongst these mention must be made of the African cottons submitted by the East India Cotton Association, Ltd, Bombay. These samples are being tested with the object of enabling the Standards Committee of the Association to lay down suitable standard of length for the African cottons. As will be seen from the above statement, 30 samples of African cottons were tested up to 31st August 1932. A summary of the fibre-test results for the 1930-31 samples was placed before a meeting of the Special Appeal Committee on African Cottons appointed by the East India Cotton Association to deal with this question, and as will be seen from the following extract from a letter received from the Secretary of the Association, this body recorded its appreciation of the assistance given by the Laboratory :—

“I am directed to inform that the Special Appeal Committee on African cottons have placed on record their sense of appreciation of the very useful and valuable services rendered by the Technological Laboratory to the Association and to convey to you their best thanks for the time and trouble you have devoted with the work of carrying out staple tests on the Uganda cotton.”

At the meeting referred to above it was decided that in view of the necessity of having correct standards for these cottons, of which large quantities are imported into India, it is desirable to continue these tests for another season. Accordingly samples of fair average quality of A.R. Kampala, A.R. Busoga, and A.R. Jinja are being received and tested at the Laboratory.

A fairly large number of samples were also received for fibre-tests from the Cotton Research Botanist, H. E. H. the Nizam's Dominions, Parbhani, Hyderabad, Deccan. These included besides promising selections from Hyderabad-Gaorani, many American and Egyptian varieties which are being tried in Hyderabad (Deccan) with a view to seeing if the condition of soil and weather will be suitable for their cultivation on a large scale.

Mr. N. Hari Rao has continued to supervise the work of this section and has, in addition, made good progress in his own problem of investigating the effect of twist on the strength of cotton fibre. This work is in progress. He has also, in collaboration with Mr. C. Nanjundayya, completed an investigation on the effect of variation in humidity on the fibre-weight of different Indian cottons. In its bearing upon the spinning performance of a cotton, the fibre-weight is an extremely important property, but cotton being a highly hygroscopic substance, it is affected to a very appreciable extent by changes in the humidity of the surrounding atmosphere. It is, therefore, necessary that the variation in the fibre-weight should be accurately known under the conditions of experimentation in which cottons are usually tested at the Technological Laboratory, so that suitable corrections may be applied to values obtained at different humidities. Hitherto, the corrections applied are based upon the results obtained by Urquhart and Williams and published in the *Journal of the Textile Institute*, Vol. XVIII, T38, 1926. But as the conditions under which these authors obtained their results did not exactly conform to those ordinarily prevailing at the Technological Laboratory, it was regarded desirable to undertake this investigation at the Laboratory. This was made possible by the use of the small new Humidifier which was installed in the Laboratory last year and by means of which it was feasible to obtain any desired humidity up to 85 per cent. R. H. in the experimental room. Accordingly eight standard cottons representing different types and Provinces were selected and the variation in the weight of their fibres was studied at different humidities ranging from 30 per cent. R. H. to 85 per cent. R. H. Some of this work needs repetition, and as soon as the results of these repeat tests are available, they will be published in a Technological Bulletin.

Physics Section.—In collaboration with Mr. R. P. Richardson, Mr. D. F. Kapadia is carrying on the investigation on the effect of different settings of the carding engine on the regularity of sliver, percentage of waste losses, the quality of yarns spun, etc.

Mr. R. S. Koshal completed his investigation on the variation of fibre-length, fibre-weight and fibre-strength of hairs growing on different parts of the cotton seed. The results of this investigation have been written up in

the Technological Bulletin, Series B, No. 14, which has been published in the *Journal of the Textile Institute*. A summary of the bulletin will be found under "Publications."

Mr. Srinagabushana has also completed his investigation on the variation in rigidity, number of convolutions and ribbon-width of cotton hairs growing on different parts of the seed. This work forms a supplement to the work done by Mr. Koshal and, taken together, they constitute a thorough examination of the asymmetry which was found to exist in the properties of cotton fibres growing on different parts of the seed. Owing to the fact that Mr. Srinagabushana had to leave the Laboratory to take up his new appointment as Technological Assistant at Surat, he has not been able to write up an account of his work. As soon as this is written, it will also be published in the form of a Technological Bulletin.

Mr. C. Nanjundayya.—It has been mentioned above that in collaboration with Mr. Hari Rao, Mr. C. Nanjundayya devoted part of his time during the period under review to studying the variation in the fibre-weight of cotton fibre with changing humidity. He has also continued his investigation on the variation in fibre-strength with length-grade of cotton fibre, but this investigation was suspended for some time in favour of another problem which has been engaging the attention of Mr. Nanjundayya and the writer. This problem relates to the development of a new method of measuring the mean fibre-length and fibre-weight of a cotton. As is well known, these two properties taken together constitute the most important link between the spinning performance of a cotton and its fibre properties. They are at present determined by methods which are capable of giving fairly accurate results but which require considerable time for their determination. The method which is being evolved at the Technological Laboratory aims at a determination of these two properties in a single operation, the results being of the same order of accuracy as obtained at present with the old methods but the duration of experiment being greatly reduced. The preliminary tests on this new method have given encouraging results and an apparatus is now under construction, by means of which it is intended to make the final trials.

Mr. Ram Narayan Mathur, who was appointed Temporary Junior Research Assistant on 27th May 1932, has been engaged on a detailed study of the ribbon-width of cotton hair with a view to finding any possible relationship between this property and the fibre-weight of the cotton tested. Ordinarily ribbon-width is measured by placing the fibres between two slides under a microscope; but, as these measurements are only taken in one plane and as the cross-section of the fibre is anything but circular at most places, it was felt that additional light on the subject would be thrown if the ribbon-width were measured in two planes perpendicular to one another. Accordingly an apparatus was designed by means of which it was possible to rotate the fibre through any angle without removing it from under the microscope. Mr. Mathur has completed his investigation on five cottons and the work is in progress.

Chemistry Section —In order to complete the investigation on the asymmetry of properties of fibre growing on different parts of the seed, Mr. D. L. Sen has been engaged in the chemical analysis of the seed-coat and the kernel of the two halves of the seed. The results of these experiments, taken in conjunction with Mr. Sen's previous results, on the chemical analysis of the fibres growing on different parts of the seed are very interesting but in the present stage of our knowledge somewhat difficult to explain. Further work on this problem is under contemplation in order to remove the anomalies which are found to exist as between the wax content and ash content of the fibres on the one hand and of the seed-coat and the kernel on the other.

Mr. Sen has also been engaged on the determination of the moisture content of samples drawn from fully pressed bales of cotton as they are ordinarily received in Bombay. A report on this work is given under the heading "Moisture Testing Section."

It will be remembered that some experiments were performed at the Laboratory in 1929 in connection with the spontaneous combustion of cotton. These experiments were mostly on loose cotton and gunny-bag material. It was felt that in order to extend the work which had already been done fresh experiments should be undertaken on small bales pressed approximately to the same density as the commercial bales so as to examine the behaviour of cotton as regard spontaneous combustion under conditions which are ordinarily found to prevail in the godowns. For this purpose, small hard-pressed bales were prepared from clean, dry and damp cotton. In some of these bales the lint was impregnated with 10-15 per cent water and half per cent, unsaturated vegetable oil. Previous experiments had shown that the co-existence of water and cotton would result in the production of inflammable gases and it was thought that perhaps the presence of unsaturated oils might start spontaneous combustion as a result of the evolution of sufficient quantities of heat on the rapid oxidation of the unsaturated oils. In this manner extremely favourable conditions for spontaneous ignition were provided in these small hard-pressed bales. These bales were kept in the sun for nearly five months and a record of the daily maximum temperature was maintained, but the experiment yielded negative results as none of the bales showed any sign of spontaneous combustion throughout this period.

Microscopy Section — Mr. Gulati has completed the re-determination, by the improved method, of the percentage of mature hairs in 31 cottons selected in connection with the problem of neppiness in cotton. This work has given rise to another subsidiary problem, viz, the objective determination of the number of neps in a yarn. The present method of counting the number of neps in a given length of yarn is not entirely satisfactory as it is subject, to some extent, to personal errors. In order to reduce the personal element to a minimum, a method is being developed by which it is hoped it would be possible to count the number of neps with at least as much accuracy as is obtained in the maturity count tests. This problem bristles

with difficulties as the instruments which have so far been designed and tried have partially failed to distinguish between proper neps and yarn irregularity. Work on this line is in progress.

In addition to these two investigations, Mr. Gulati has carried out a number of maturity tests on agricultural samples for which the demand seems to be expanding. Many cotton breeders now are not satisfied merely with the fibre-length and fibre-weight per inch of their cottons, especially in such cases where these are to be used as parents in hybrids, but require more detailed knowledge of the fibre-properties of their samples. All the work in connection with the testing of such samples is being done by Mr. Gulati in the Microscopy Section.

III. MOISTURE TESTING SECTION.

It will be recalled that last year experiments were conducted on the determination of moisture content of samples drawn from bales pressed under known conditions of humidity. In order to supplement this work and to meet the possible objection that the conditions under which these special bales were pressed did not conform to those obtained for the ordinary commercial bales, it was decided to extend this work by determining the moisture content of samples drawn from commercial bales as they are ordinarily received and stored in the Bombay godowns. The East India Cotton Association was asked to provide facilities in the matter of drawing samples and it very kindly agreed to do so. During the period under review 97 samples were tested in connection with this second series of tests. Preliminary reports describing the principal conclusions derived from the results of both series of tests were placed before the Moisture Tests Sub-Committee of the East India Cotton Association. After very careful consideration it was decided that, owing to the importance to the trade of these tests and the very interesting results especially with regard to the low moisture content of many of the Indian cottons which have emerged as a result of this work, these tests should be continued next year. The East India Cotton Association, furthermore, placed on record its appreciation of the work done by the Technological Laboratory in connection with the determination of moisture content of bales of Indian cottons as will be seen from the following letter received from the Secretary of the Association:—

“I am directed to inform you that the Moisture Tests Sub-Committee appointed by the Board of Directors of my Association have placed on record their sense of appreciation of the very useful work done by the Technological Laboratory, and, especially, by you in connection with the experimental tests with a view to ascertaining the normal moisture content in cotton bales which have proved to be of considerable help both to the cotton trade and cotton industry and to convey to you their best thanks for the time you have devoted and the trouble you have taken in the work of carrying out such tests.”

The other investigation on the variation in the weight of bales under different conditions of humidity has now been completed and its results are in the course of being written up in the form of a bulletin. When this bulletin is published the question of issuing another bulletin embodying the results of tests on specially pressed and commercial bales will be considered.

IV. PUBLICATIONS.

The following is a list of Technological Bulletins and Circulars issued during the period under review :—

I. Technological Bulletins, Series A, Nos. 19-20 and 21.

- (1) Series A, No. 19, March 1932, Application of Different Systems of High Draft Spinning to the Mixings of Indian Cottons, by R. P. Richardson, F.T.I., and Nazir Ahmad, M.Sc., Ph.D.
- (2) Series A, No. 20, April 1932, Spinning Tests on Mixings of Long-staple and Short-staple Indian Cottons, by Nazir Ahmad, M.Sc., Ph.D.
- (3) Series A, No. 21, July 1932, Reports on Standard Indian Cottons, 1932, by Nazir Ahmad, M.Sc., Ph.D.

II. Technological Bulletins, Series B, No. 14, May 1932, "Variation in the Properties of Cotton Fibre in relation to its position on the Surface of the Seed," by R. S. Koshal, M.Sc., and Nazir Ahmad, M.Sc., Ph.D.

III. Technological Circulars, Nos. 59-80, as under :—

Circular No.	Cottons.	Date of publication.
59	Kadi-Virangam and Tinnevely, 1930-31	August 1931.
60	Dhulia (Khandesh), 1931-32	December 1931.
61	Umri Bani, 1931-32	January 1932.
62	Verum 262 (Akola), 1931-32	January 1932.
63	Ujjain cottons, 1931-32	February 1932.
64	Khandesh cottons, 1931-32	February 1932.
65	Verum 262 (Nagpur)	February 1932.
66	Punjab-American 289F, 1931-32	February 1932.
67	Punjab-American 4F, 1931-32	February 1932.
68	Jaywant (Kumpta), 1931-32	April 1932.
69	Broach (Salar), Bailhongal, and Hubli-Kumpta cottons, 1931-32	May 1932.
70	Jagadia and Kadi cottons, 1931-32	May 1932.
71	Hubli-Kumpta and Hubli-Upland cottons, 1931-32	May 1932.
72	C. P. No. 1, Muttia and Berar cottons, 1931-32	May 1932.
73	Latur and Nanded cottons, 1931-32	May 1932.
74	Surat and Broach cottons, 1931-32	June 1932.
75	Punjab-American, Jagadia Farm and Navsari cottons, 1931-32	June 1932.
76	Dhollera, Westerns, Farm Westerns and Kumpta cottons, 1931-32	July 1932.
77	Bijapur and Tinnevely cottons, 1931-32	July 1932.
78	Upland, Cambodia and Karunganni cottons, 1931-32	July 1932.
79	Kadi-Virangam and Khandesh cottons, 1931-32	August 1932.
80	Kalagin and Bagalkote cottons, 1931-32	August 1932.

Reference has already been made to new features of Technological Reports on Standard Indian Cottons, 1932 ; the following are the summaries of the other bulletins :—

(1) *Series A, No. 19, Applications of Different Systems of High Draft Spinning to Mixings of Indian Cottons.*—This bulletin describes the results of tests carried out on mixings of two Indian cottons, using three different systems of high draft spinning and the ordinary system. This investigation is in continuation of the preliminary tests already made in this Laboratory and reported upon in Technological Bulletin, Series A, No. 15. The high draft systems have been called System A, System B and System C, of which Systems A and B are the same as were used in the preliminary tests. A short description of the mechanical construction of each system is given in this bulletin.

The subject is introduced by a short discussion on the principal causes responsible for producing irregularity in the structure of yarn, and the part played by the physical and chemical properties of a cotton during the process of drafting. As a result of this discussion it is shown that cottons possessing long and fine fibres are capable of withstanding the disturbing effects of long drafts to a much greater extent than those possessing short and coarse fibres.

The experimental work involved, 7,560 lea tests, 8,160 tests for ballistic work of rupture, 5,600 tests for twist, and examination of yarns for evenness and neppiness. The results are presented in the form of tables from which the following conclusions are drawn :—

(1) Of the three high draft systems, System C gave comparatively few breakages with both twist multipliers (4.0 and 4.5), System A, few with the lower but rather too many with the higher, while System B gave most breakages with both ; of the three modes of spinning on the ordinary system the tape drive arrangement gave fewer breakages with the lower twist but more with the higher as compared with the band drive arrangement, while spinning from double roving, double draft, suffered from the highest number of breakages. The various systems have been arranged in a table of merit with yarn-breakages in the ring frame as criterion.

(2) Within the range of cottons and machinery used in these experiments, twist as an aid for reducing yarn-breakages in the ring frame is most effective when short-staple cottons are spun on the ordinary system, and least so when comparatively long-staple cottons are spun on any of the three high draft systems.

(3) There is a large decrease in the number of yarn breakages as the quality of mixing improves. This shows one of the advantages of using a mixing of a good quality, as with fewer breakages, the number of ring piecers required to look after the frames would be correspondingly less.

(4) There is no apparent relationship between count and number of neps per yard-length of yarn, nor does the mode of spinning make any appreciable difference to the latter.

(5) Almost invariably yarns spun on the high draft systems are more even than those spun on the ordinary system. Among the latter, spinning from double roving, double draft, gave decidedly the most uneven yarns while the ring frame with tape-driven spindles gave on the whole more even yarns than the other. The different systems have been assigned suitable places in a table of merit with yarn evenness as criterion.

(6) In every case, the three high draft systems have given stronger yarns than the ordinary system. This at once suggests two economically advantageous ways of employing a high draft system, (i) using mixings of an inferior quality but obtaining yarns of the same quality as with the ordinary system; (ii) using mixings of the same quality but obtaining yarns of superior quality.

(7) The ring frame with tape-driven spindles gave better results in each case than the one with hand-driven spindles. Since in all other respects the two ring frames were identical, this is attributed to less slippage and more uniform tension in the case of the former. This conclusion is applied to high draft system C which, contrary to high draft system A, was also fitted with tape drive arrangement.

(8) Double roving, double draft, gave weaker yarns with coarser mixings but stronger yarns with finer mixings as compared with single roving, ordinary draft. The theoretical implications of this result are discussed.

(9) Yarns spun from intermediate roving on high draft systems A, B and C do not come up to the level of those spun from double hank roving on the same systems, but they compare very favourably indeed with those spun on the ordinary system, especially when spindles of the latter are hand-driven. This shows a third way of using a high draft system which would reduce costs as compared with the ordinary system. One of the processes (in the present tests processing on the roving frame) may be completely eliminated without appreciably reducing the quality of yarn, thereby effecting considerable saving in initial outlay, labour charges, running expenses, etc. Alternatively, fewer preparations may be made, keeping some of the spindles in each process idle, and yarn may be spun from a coarser hank roving. The adoption of any one method out of these four must be left to the individual discretion of the mill going in for high draft spinning.

Taking all the results into consideration a table of merit showing the relative performance of the high draft systems and the ordinary system withlea strength of yarns as criterion has been prepared.

(10) The percentage difference in breaking strength of yarns spun on a high draft system and the ordinary system diminishes rapidly as the quality of mixing improves. This is explained in terms of the specific action of the mechanism of a high draft system on the short fibre present in a mixing.

(11) Increase in yarn strength produced by inserting higher twist is greatest when short cottons are spun on the ordinary system. Coupling this with the observation made above that twist is most effective in reducing yarn breakages in the ring frame under similar conditions, we conclude that the binding effect of twist on fibres is most pronounced when short cottons are spun on the ordinary system.

(12) For the special benefit of practical men a table has been prepared which shows the corrected lea strength values, for all the mixings, spun into suitable counts, on the different systems of spinning employed in these tests.

(II) *Series A, No. 20, Spinning Tests on Mixings of Long-staple and Short-staple Indian Cottons.*—This bulletin describes the results of tests on mixings of long-staple and short-staple Indian cottons performed with the object of gauging the harmful effects of adulterating quality cottons with poor types. It is found that in every case, such a practice impairs the quality of yarn, even when the proportion of the short-staple cotton is relatively small. The number of yarn breakages in the ring frame mounts up, yarns become progressively less even and in one case (4F and Mollisoni) are found to be considerably neppier than those spun from either of the two pure cottons.

The diminution in yarn strength, in some cases, is phenomenal. Karunganni, which in the pure unadulterated state will yield a good 20's warp, is found suitable for no more than 12's standard warp counts, when mixed with 25 to 30 per cent. of the short-staple Pulichai cotton. It is further found that if the fibre-properties of the short-staple variety differ considerably from those of the long-staple variety, the diminution in yarn strength is both regular and continuous, so that, within a wide range of percentage composition, the spinning performance is very nearly proportional to the amount of the inferior growth present in the mixing. Such, for instance, is the case with P.A. 289F and Mollisoni. The former has a long and fine staple, while the latter is a relatively coarse and short-stapled variety. It follows that, as the percentage of Mollisoni in the mixtures is gradually increased by equal amounts at a time, the highest standard warp counts for which the mixtures are found suitable decrease in a regular manner—a decrease of three units in the latter being associated with an increase of 10 per cent. in the proportion of the former. On the other hand, when the fibre-properties of the inferior variety do not differ so radically from those of the superior variety, the spinning performance of the mixtures declines at first rapidly and afterwards slowly, as the proportion of the short-staple cotton is gradually increased. The difference in the behaviour of these

two series of mixtures has been explained quantitatively in terms of the modification of their fibre-properties. It is realized that in actual practice it is neither customary nor advisable to attempt to mix widely dissimilar cottons; nevertheless it will be found useful to bear the above two conclusions in mind in order to form a correct estimate of the spinning performance of a mixture of known composition.

The observation made above that diminution in the strength of yarns spun from a mixture of two dissimilar cottons is directly proportional to the amount of the short-staple component gives us a useful working rule which may be applied either to infer the spinning performance of a mixture of known composition or to estimate the composition of a given mixture.

(III) *Series B, No. 14, Variation in the Properties of Cotton Fibre in relation to its position on the surface of the seed.*—The experiments described in this bulletin relate to the following fibre-properties in relation to the position of the fibres on the surface of the seed: (i) fibre-length, (ii) fibre-weight, (iii) fibre-strength. The material consisted of a single seed of Surat 1027 A.L.F., and groups of 200 seeds of six Standard Indian Cottons, two of which were also tested for two seasons. The lint was obtained from the following regions of the seed—(i) the apex or the pointed end, (ii) the base or the butt end, (iii) the right flank, (iv) the left flank, (v) the hairs removed in gentle combing by hand—‘the combed hairs.’ The position of the point of rupture in a single hair break was also examined by mounting fibres between two types of eyelets, one made of brass and the other of aluminium, the former always attached to the basal position and the latter to the apical position of the fibre.

From the study of the graphs and the analysis of the test results the following conclusions have been drawn:—

(1) The frequency distribution of fibre-length is approximately symmetrical and normal not only for fibres taken from the whole seed but also for fibres taken from different regions of the seed.

(2) The mean fibre-length for fibres at the base of the seed is significantly greater than for fibres at the apex of the seed, indicating that the basal fibres are longer than the apical ones.

(3) Not only is the asymmetrical distribution of fibre-strength a characteristic of all fibres from the seed, but also, in the different regions of the seed, the distribution of fibre-strength is definitely skew.

(4) The mean fibre-weight per unit length and the mean fibre-strength are significantly higher for the apical than for the basal fibres.

(5) The values of the mean fibre-length, the fibre-length distribution, fibre-weight, and fibre-strength are practically the same for the right and

the left flanks,—the small differences observed between them are well within the sampling error.

(6) The fibres which are removed in the process of combing the seed by hand are generally those which have got the least fibre-weight.

(7) For the majority of fibres (about 80 per cent) the point of rupture in single hair breaks is located in the *apical point* of the fibre. There is a low correlation between the point of break and strength, indicating that there is a tendency for the comparatively weak fibres to break near their apical ends.

(8) The percentage differences between base and apex mean values of the various fibre-properties are different for different cottons.

(9) There is a distinct tendency for a high ginning percentage to be associated with low percentage difference between mean fibre-length of hairs taken from the apex and base of a seed.

The practical applications of this investigation are discussed in Section VII. It is pointed out that in selecting new strains the cotton breeder should pay attention not only to the absolute values of the fibre-properties, but also to the percentage difference between the mean values of the properties of hairs growing on the base and the apex of the seed. An analysis on these lines will at once differentiate between two strains with respect to the regularity of their staple, thus enabling the breeder to select the particular strain which will yield a more uniform lint. Secondly, on account of the large differences in the base and apex mean values of some cottons, it is suggested that if a method of differential ginning could be devised which would remove the lint from the two flanks and the base of the seed separate from that on its apex, it would be possible to obtain from the same seed two lots of cotton, one lot being appreciably longer and finer than the other. Such a differential gin would act as a combined ginning and combing machine. The suggestion is made for the benefit of those who have a mechanical bend of mind. Thirdly, it is pointed out that in view of the unexpectedly large difference in the base and apex mean values of the various fibre-properties it is extremely necessary, wherever possible, to take a fairly large sample for the determination of any of the fibre-properties. Where, owing to the tedious and time-absorbing nature of the work, a fairly large sample is ruled out; the sample selected should be so constituted as to be *thoroughly* representative of the bulk, otherwise a preponderance of basal or apical hairs in the sample will introduce a large error in the result.

V. GENERAL.

Visit of the Indian Tariff Board.—On 28th June 1932 the President and members of the Indian Tariff Board kindly paid a visit to the Laboratory. They were received by Mr. S. D. Saklatvala, Mr. P. H. Rama Reddy and

the writer, and were taken round the different sections of the Laboratory. They evinced keen interest in the work of the Laboratory and discussed in detail its theoretical and practical aspects.

Staff.—The staff of the Laboratory on 31st August 1932 was as follows :—

Director.—Nazir Ahmad, M.Sc., Ph.D.

RESEARCH LABORATORY.

Physics Section :—

Senior Research Assistants.—Harirao Navkal, M.Sc.; Ram Saran Koshal, M.Sc.

Junior Research Assistant.—C. Nanjundayya, M.Sc.

Temporary Research Assistant.—R. N. Mathur, M.Sc.

Junior Testing Assistants.—S. S. Sukthankar, L.T.C.; K. G. Deo; H. B. B. Joshi, B.Sc.; K. S. Marar, B.A., LL.B.; R. G. Panvalkar, B.Sc.; S. Samson, B.Sc.

Chemistry Section :—

Senior Research Assistant.—D. L. Sen, M.Sc. Tech., M.Sc., A.I.I.Sc., A.I.C.

Microscopy Section :—

Junior Research Assistant.—A. N. Gulati, M.Sc.

Draughtsman.—B. G. Mehta.

Instrument Maker.—Moreswar M. Patke.

SPINNING LABORATORY.

Spinning Master.—R. P. Richardson, F.T.I.

Senior Research Assistant—

(*Assistant Technologist*).—D. F. Kapadia, B.Sc.Tech., B.A.

Yarn Testing Section :—

Statistician.—V. Venkataraman, M.A.

Junior Testing Assistants.—G. D. Bhide, B.Sc.; K. V. N. Nayar; V. N. Modak, B.Sc.; L. V. Sundararaman, B.A.; P. S. Sambamurthi; G. J. Kharkar, B.Sc.; A. J. Farid; U. K. Benegal, B.A.; P. V. Nachane, B.Sc.

Statistical Clerks.—R. Krishna Iyer; P. K. Wagle.

Spinning Assistant.—N. Iyengar.

Electrician.—Herculano Lobo, L.E.E.

Clerk.—D. C. Mullan.

DIRECTOR'S OFFICE.

Head Clerk.—M. T. Majmudar.

Stenographers.—B. P. Jain; M. T. Sundaram.

Mr. R. P. Richardson, Spinning Master, proceeded on short leave, sanctioned by the Standing Finance Sub-Committee, from 4th March 1932 to 29th April 1932. During his absence on leave Mr. D. F. Kapadia officiated as Spinning Master.

Mr. R. S. Koshal was granted 7 months' study leave by the Indian Central Cotton Committee, and proceeded to England on the 2nd May 1932.

Mr. C. Nanjundayya, who was on the staff of the Laboratory as Temporary Research Assistant, was appointed Junior Research Assistant from 1st August 1932 in the place of Mr. H. N. Dutt.

Mr. Srinagabushana, who was a Temporary Research Assistant, was appointed as Technological Assistant at Gujarat, Surat, with effect from the 12th March 1932.

On account of the transfer of Mr. Srinagabushana to Surat to take up the new post and the absence of Mr. R. S. Koshal on study leave outside India, Mr. R. N. Mathur, M.Sc., was appointed a Temporary Research Assistant for a period of one year with effect from 27th May 1932.

Messrs. K. M. Samant, M.Sc., and V. S. Raghavan, B.A., were appointed Temporary Junior Testers for a period of three months with effect from 21st September 1931.

Preparation of Exhibits.—The Indian Central Cotton Committee, at its meeting held on the 13th and 14th July 1931, decided that sets of exhibits from standard Indian and certain other improved varieties of cottons should be prepared at the Technological Laboratory. One of these sets has been prepared at the request of the Imperial Council of Agricultural Research, who have decided to participate in the forthcoming World's Grain Exhibi-

tion and Conference, which is to be held in July-August 1933 at Regina, Canada. The other set has been prepared for the Directors of Agriculture who will send them to the Agricultural Fairs and Exhibitions held in the country as the occasion arises.

These two sets which consist of the following exhibits, have been prepared from 18 standard Indian cottons and two non-standard cottons :—

(1) 6 combed seeds fixed on black cardboards ruled in inches to show the staple length of the cotton.

(2) Card sliver to show the regularity and the cleanliness of the sliver made from the cotton.

(3) *Yarn bobbins*.—4 yarn bobbins from each cotton to show the general appearance and the degree of cleanliness of yarns spun from each cotton.

(4) *Yarn knots*.—Two yarn knots from each cotton to which labels are attached showing the counts for which the cotton is suitable, the strength, the turns per inch inserted, and the front roller speed which is an indication of the production of yarn per hour.

(5) *Black winding cards*.—One for each cotton on which samples of yarns are wound to show the degree of evenness and neppiness of the yarn.

These sets will be disposed of in accordance with the decision of the Committee.

Alignment of machines.—It was mentioned in my last Annual Report that all the machines up to the Card which had been found to be somewhat out of alignment owing to the gradual sagging on the floor of the Spinning Laboratory have been properly re-set and re-aligned. This process was continued in the period under review right up to the ring frames. Consequently all the machines have now been re-aligned.

ACKNOWLEDGMENTS.

I have pleasure in acknowledging my indebtedness to the office-bearers of the Indian Central Cotton Committee for many valuable suggestions, to W. Ellis Jones, Esq., for kindly valuing test samples, to office-bearers of the East India Cotton Association, especially Mr. C. M. Parikh, for giving full facilities for experiments on the variation of moisture in bales, and to the members of the East India Cotton Association, especially Messrs. Patel Cotton Co., for kindly supplying samples for moisture tests. I have also pleasure in acknowledging the very helpful manner in which the staff of the Laboratory have carried out their arduous duties and the loyal co-operation which I have throughout received from my Office Staff.

NAZIR AHMAD,
Director, Technological Laboratory.

Dated 10th November 1932.

APPENDIX I.

LIST OF RESOLUTIONS.

- "The Central Cotton Committee approves in principle of the draft bill which has been introduced by a private member into the Central Provinces Legislative Council for supplying the Central Provinces with organised cotton markets on the lines of those in Berar."
- "The Central Cotton Committee approves of the action taken by the Local Sub-Committee in recommending to the Madras Government less drastic legislation under the Madras Cotton Control Bill provided that the scope of the Bill is restricted to the growing of *Pulichai* cotton in the Tinnevely area."
- "That the Report of the Local Sub-Committee on pools of cotton ginning and pressing factories be adopted."
- "That a sum amounting to Rs. 10,000 be provided in next year's budget for the initial expenses of an investigation into the cost of production of cotton and rotation crops."
- "That the Central Cotton Committee, while being thoroughly appreciative of the work which some Provincial Cotton Committees have accomplished, feels that sufficient use is not made of these local advisory bodies and recommends that they should be more closely associated with all matters connected with grants from the Committee. The Central Cotton Committee further deplors the action of the United Provinces Government in failing to re-constitute the United Provinces Provincial Cotton Committee but trusts this will last only for the period of the financial stringency."
- "That Directors of Agriculture and others responsible for the preparation of cotton forecasts be asked to continue their co-operation in investigating the discrepancies pointed out in the Secretary's note between the forecasted crop and the press returns in the Provinces and Indian States with a view to obtaining greater accuracy in the cotton forecasts."
- "The Central Cotton Committee desires to thank the Government of India for agreeing to its request to separate the Kathiawar States from the Gujerat Trade Block for the purpose of compiling the Raw Cotton Trade Statistics."
- "The Central Cotton Committee has read with considerable pleasure the first report on the working of the Dhulia Cotton Market and suggests to the Bombay Government that a copy should be sent to every District Local Board and Municipality in the Presidency interested in cotton with a view to acquainting them with the successful establishment of a market run in the interests of the grower."
- "The Central Cotton Committee wishes to denounce the proposal passed by the Bombay Municipal Corporation to impose a cess of four annas per bale on all cotton exported from Bombay, as this cess will fall on the grower who will receive less for his produce. The Central Cotton Committee trusts the Bombay Government will refuse sanction to the proposal in the interests not only of the growers in the Presidency but of those in other parts of India."
- "The Indian Central Cotton Committee thanks the Bombay Government for acceding to its request by sending copies of the first report on the working of the Dhulia Cotton Market to all District Local Boards and Municipalities. The results already achieved are encouraging and the Committee trusts that the spread of the knowledge of the benefits of regulated markets will lead to the establishment of a larger number of such markets in the near future."

"The Indian Central Cotton Committee wishes to express its appreciation of the interest shown by the Indore Darbar in connection with the regulation of cotton markets in the State and trusts that its efforts in this direction will have the desired effect of securing better prices to the grower of cotton."

"That a copy of the previous discussion on this subject be circulated to all commercial and agricultural bodies interested in cotton and to the Government of India and that the matter should be brought up at the next meeting of the Committee for further discussion and final decision."

"The Indian Central Cotton Committee thanks the Madras Government for the opportunity afforded to it of expressing its views on the Madras Cotton Control Bill and for giving effect to its recommendations by incorporating the necessary amendments in the Bill."

"That before this memorandum* was compiled the Local Sub-Committee should invite all the members to send an expression of their views with their reasons therefor and the Secretary, who would then finally collect all the information, should put them before the Local Sub-Committee."

"That the Government of India be requested to arrange for separate trade statistics for loose cotton for such trade blocks as, in the opinion of the provincial authorities responsible for the compilation of cotton forecasts, are of importance for their purposes."

"That the Indian Central Cotton Committee approves of the future policy and programme of research work of the Institute of Plant Industry, Indore, as laid down in the Report submitted by the Director, subject to the amendment proposed by Mr. Collins."

"That the Indian Central Cotton Committee approves the action of the Standing Finance Sub-Committee in appointing Rao Bahadur Bhimbhai Ranchodji Naik on the Advisory Board of the Imperial Council of Agricultural Research *vice* Mr. S. D. Saklatvala resigned."

"The Indian Central Cotton Committee has read with great interest the proceedings of the Central Provinces, Sind and Punjab Cotton Committees and trusts that the good work that is being done by these bodies will be of permanent value to the cotton industry of the provinces concerned."

"That the next cold weather meeting of the Committee be held in Sind."

"That Rao Bahadur Bhimbhai Ranchodji Naik and Mr. M. P. Kolhe be appointed to represent the growers' interests on the Board of the East India Cotton Association."

* Memorandum on the proposed compilation and publication of All-India Cotton Forecasts by the Committee.

APPENDIX II.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Annual Report for the year ended June 30th, 1932.

1. *Introduction.*—The Institute of Plant Industry is a Society registered under the Holkar State Societies Act, and its primary objects are:—

- (a) The investigation of all matters relating to the production and improvement of raw cotton in India.
- (b) The agricultural development of the territories of the Princes and Chiefs under the Suzerainty of His Majesty exercised through the Governor-General of India or through any Governor or other officer subordinate to the Governor-General of India who shall be members of the Society.
- (c) The training of officers and cultivators nominated by such Princes and Chiefs.
- (d) The training of advanced students nominated by the Indian Central Cotton Committee.

Its funds are derived entirely from subscriptions; the Indian Central Cotton Committee has made annual grants varying from Rs. 85,000 to Rs. 1,15,000 and the member-States of Central India and Rajputana subscribe another Rs. 47,000 yearly. The Cotton Committee is, naturally, most closely interested with the fulfilment of objects (a) and (d), and in fact has spent more upon the Institute than upon any other of the schemes which they have supported; their total annual subscriptions now amounting to Rs. 7,46,000 and their donations for capital outlay to Rs. 2,83,500. Their special interest, however, has not led to unconcern for the other side of the work and it is fully realized that each is complementary to the other and in no sense antagonistic.

The Governing Body of the Institute is representative of the Cotton Committee and the member-States and its President is *ex-officio* the Agent to the Governor-General in Central India. The Director of the Institute is also Agricultural Adviser to States in Central India and Rajputana, and in addition represents all those States upon the Indian Central Cotton Committee.

This constitution has proved itself admirably suited to the needs of a research station and centre for agricultural development; administration is made smooth and efficient, while financial control and purity is ensured through detailed budget estimates and quarterly audits by a firm of Chartered Accountants. The elasticity of a commercial undertaking is thus gained in large measure with a great resultant increase in efficiency.

2. *Meetings, General and Board of Governors.*—A general meeting of the Society was held at the Institute on February 11th, 1932. Several Rules and Regulations were amended to suit changed conditions, notably with regard to representation on the Board of Governors. The Board was increased from 7 to 11 members and an electoral principle for States representation was laid down. The Board of Governors met on the following day.

3. *States contributing as Members of the Institute.*—At the closing date of this report the following twenty States were members of the Institute, arranged in order of joining:—

CENTRAL INDIA AND RAJPUTANA.

Indore.	Dewas, S. B.	Barwani.	Bundi.
Dhar.	Sitamau.	Jhalawar.	Partabgarh.
Jaora.	Narsingarh.	Bikaner.	Bagli.
Datia.	Tonk.	Rewa.	Orchha.
Rutlam.	Bijawar.	Jaipur.	Bharatpur.

A number of other important States are considering joining but the existing financial stringency in all quarters causes much hesitation over any new expenditure, however desirable.

4. *Staff and Students*.—The Directorship of the Institute, vacant through the retirement of Mr. Albert Howard, C.I.E., M.A., had been filled by the appointment of Mr. F. K. Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab.), formerly Director of Research in the Department of Agriculture, Iraq, who took up his duties on July 21st, 1931.

Two new posts have been sanctioned by the Board of Governors, one for a thoroughly well qualified Geneticist and Botanist, in order that research work, especially on cotton, may be expanded, the other for an Extension Officer to devote his whole energies to the development of agriculture in the contributing States.

The Indian Central Cotton Committee, having awarded a scholarship of Rs. 100 per month for research training in Plant Breeding and Cytology, posted the holder to the Institute for the year under report.

The Irwin Scholarship fund (Rs. 4,000) donated to the Institute on July 29th, 1928, by Sir Sarupchandji Hukamchand, was exhausted during the year.

From Institute funds four Research Studentships carrying honoraria of Rs. 50 per month were created to enable young men of good qualification to obtain training in research work, preference being given to those nominated by or associated with the contributing States. These studentships are proving of advantage both to the Institute and the holders. A list of the staff and research students on June 30th, 1932, is given on page 77.

5. *Visitors*.—The following list of visitors during the year indicates the wide interest taken in the Institute, not only by its direct supporters but by others :—

Apji Amarsingh of Koela, Kotah State, Rajputana.
 Rai Sahib R. L. Batra, P.C.S., B.A., LL.B., Revenue Member, Bharatpur.
 Seth Bhanwar Lal Sethi of Messrs. Binod Ram Balchand, Bankers, Indore.
 Raj Kumar Chatterje, Esq., B.A., Bar-at-Law, Dewan, Banswara State, Rajputana.
 F. C. Coventry, Esq., Dewan, Partabgarh State, Rajputana.
 M. H. Crofton, Esq., I.C.S., Excise Commissioner, Central India, Indore.
 Rao Bahadur Col. Thakur Devisingh of Chitore, Jaipur State, Rajputana.
 Major M. V. Deolekar, Private Secretary to H. H. the Maharaja of Dewas, S.B., Central India.
 G. T. Dyer, Esq., C.I.E., I.C.S., Revenue Member and President of Council, Bhopal State, C. I.
 Sir Reginald Glancy, K.C.I.E., Member, Indian States Inquiry Committee.
 Duncan Hall, Esq., Secretary, League of Nations, Geneva, Switzerland.
 Rao Bahadur H. N. Gosala, M.A., LL.B., Dewan and President, State Council, Barwani, C.I.
 Munshi Himmat Singh K. Maheshwari, M.A., Revenue Member, Jodhpur State, Rajputana.
 Major-General Hutchinson, Member, Indian States Inquiry Committee.
 Sahibzada Ismail Ali Khan of Tonk State, Rajputana.
 Apji Kalyansingh of Koela, Kotah State, Rajputana.
 Rao Saheb N. A. Kathavate, B.A., Member of Council, Narsingarh State, C. I.
 Sir Joseph A. Kay, Vice-President, Indian Central Cotton Committee, Bombay.
 Dr. B. A. Keen, Director, Imperial Institute of Agricultural Research, Pusa, Bihar, and Assistant Director, Rothamsted Experimental Station, England.
 Mr. Patrick, Secretary, Indian States Inquiry Committee.
 Maharaj Kumar Lokendra Singh of Manipur State, Assam.
 Kumars of the Daly College, Indore, C. I.
 Kumars of the Mayo College, Ajmer, Rajputana.
 His Highness the Maharawat of Partabgarh State, Rajputana.
 Rao Bahadur Mansingh of Barwara, Jaipur State, Rajputana.

Lala Mulk Raj, Chief Revenue Officer, Dhar State, C. I.
 Sahibzada Mahmud Ali Khan, Dewan, Baoni State, C.I.
 Pandit Nand Kishore Chaturvedi, M.A., LL.B., Deputy Commissioner, Rewa State, C.I.
 Dewan Bahadur Sardar Pandit Narayan Prasad of Dewas State (Senior), C. I.
 Maharaj Kumar Narindra Singh, Heir-Apparent, Panna State, C. I.
 N. Lal Singh, Esq., Chief Revenue Officer, Sitamau State, C. I.
 The Hon'ble Lieut.-Col. G. D. Ogilvie, C.S.I., C.I.E., Agent to the Governor-General in Central India, Indore.
 K. Raghubir Singh, B.A., Guardian Tutor to H. H. the Minor Rana of Barwani State, C. I.
 J. H. Ritchie, Esq., M.A., B.Sc., I.A.S., Secretary, Indian Central Cotton Committee, Bombay.
 Sir James Roberts, K.C.I.E., I.M.S. (Retd.).
 Khan Bahadur Sahibzada Sarfraz Ali Khan, Chief Secretary, Jaora State, C. I.
 Rao Bahadur Sahasrebudhe, M.Sc., Agricultural Chemist to Government, Bombay.
 Thakur Sajjan Singh, Chief of Bagli, Gwalior State.
 Khan Bahadur Syed Shaukat Ali, B.A., Dewan, Rajgarh State, C. I.
 E. F. Sykes, Esq., Member, Legislative Assembly, Delhi; Bundi Agricultural Syndicate, Bundi State, Rajputana.
 Rao Saheb B. P. Vaghalker, Deputy Director of Agriculture, Poona, S. C. D.
 Khan Bahadur D. F. Vakil, B.A., Dewan, Rutlam State, C. I.
 Dewan Bahadur Sir T. Vijayaraghavachariar, K.B.E., M.A., Vice-Chairman, Imperial Council of Agricultural Research, Delhi.
 The Heir-Apparent of Khilchipur State, C. I.

6. *Library*.—The Library continues to grow in usefulness, over 500 additions having been made during the year. It now contains nearly 3,500 text-books, reference books and volumes of periodicals, an author-catalogue of which has been prepared. Subject indexing and binding of the whole library is proceeding. Presentations include a large quantity of reprints and memoirs from Mr. A. Howard, C.I.E., M.A., the late Director of the Institute, and from the Imperial Institute, London, a set of its Bulletins from 1903 to date.

Over 200 books were sold during the year and 790 remain in stock.

RESEARCH WORK.

7. *Organization*.—Some separation of agricultural research into subjects is necessary for clarity but this should not cloud the fact that most "subjects" are closely intermeshed with each other in the general economy of agriculture. It is impossible, for example, to study fully a crop such as cotton without touching other "subjects" whether they be other crops or "separate sciences."

The growth of knowledge of agricultural science has been so rapid and has already reached such a huge sum total that some system of specialisation has been inevitable as well in academic education and training as in research work. No one man could possibly examine all sides of a problem intensively. A great danger lies in this—the development, probably unconsciously, of a series of water-tight compartments, Chemistry, Physics, Plant Breeding, Entomology, Mycology, etc., ignoring the essential inter-dependence and interactions of the phenomena dealt with in these water-tight compartments. The cynical yet apt definition of a specialist as "one who knows more and more about less and less" is a warning against this danger. In the absence of a supply of research workers possessing a degree of omniscience not usually found in mankind, the best hope of solving agricultural problems seems to lie in concerting the efforts of several workers, each approaching the objective at his own angle, yet being aware of his fellows' advances and routes. It is hoped more and more to apply this strategic system to the research work at the Institute.

8. *Weather, effects on crops*.—The monsoon broke on June 13th and resulted in a total rainfall at Indore of 42.8 inches, the annual average being a little over 30 inches. From June 27th to September 6th, 73 days, rain fell on 62 days, the dry intervals being all of one day only except for a single four-day dry period. After a dry spell of 12 days there were 25 days of rainfall during a second period of 29 days. The rainfall was thus abnor-

mally continuous; even the surface soil had no chance to dry out and the resultant excessive development of the typical colloidal "blanket," impervious to air, was disastrous to cotton especially on the heavier types of the black cotton soil of the Malwa plateau. Other crops suffered more or less according to the ability of their root systems to withstand the lack of soil aeration. On light land and especially in Rajputana rainfall and crops were more normal, though a downpour in October did harm. The winter was mild with sub-normal rainfall, which reduced yields of *rabi* crops.

9. Cotton.—(i) Improvement of variety. (ii) Physiology.

(i) *The creation of a pure and improved barani cotton for the Malwa plateau* is an important part of the programme. In 1931 for the first time a replicated-plot yield test was laid down for ten of the pure-line selections of Malvi cotton (*G. neglectum Malvensis*), indigenous on the plateau. The selections had been made mainly for lint-length and ginning percentage but yield had not previously been tested. There was scarcely any significant difference in yield between any of the selections and the "control" which was a mass-selected Malvi mixture containing very few Roseum or other impurities. The lay-out design of this test, however, was not ideal and the results must be accepted with caution but it is satisfactory that the improvement achieved in staple and quality does not appear to have reduced the yielding capacity. Samples of these selections and the control have been sent to the Indian Central Cotton Committee's Technological Laboratory, Matunga, for examination.

The question of a *variety for well-irrigated land in Malwa* does not seem likely to be solved by selection among *Malvensis* types which do not give such response to irrigation and intensive cultivation as do American cottons such as Cambodia. This is unfortunate as it involves, at present, two varieties being grown in the same area and the Americans are specially susceptible to injury from the deterioration of the black soils during the rains. Some Cambodia selections made at Indore are under examination; these show degrees of resistance to such injury.

A number of *varieties of cotton for Rajputana* were tried in single plots in Jaipur, Bikaner*, Bharatpur and Jhalawar States to gain information on general behaviour in those soils and climates.

The Botanical survey of cottons grown in India was continued and the examination of root-systems of the varieties on hand was completed. Seed of further varieties has been obtained from various Agricultural Departments, bringing the total collection up to 98.

A new piece of research work was begun in the autumn of 1931—*the effects of X-radiation of cotton seed, buds and pollen upon subsequent generations*. Remarkable mutations have been obtained by other workers, in cotton and other plants but little seems to have been done with a direct economic aim. A number of exposures were made at the King Edward Hospital, Indore, by the courtesy of its Director. Irradiated material has also been prepared for cytological examination.

(ii) Under the heading "*Physiology*" most of the work has been done upon the *relationship and reaction* of the cotton plant to its environment in the black soils of the Malwa plateau. In particular the soil and roots have been studied in relation to healthy and unhealthy Cambodia cotton plants, many root exposures having also been drawn to scale from plants at different stages of growth. The connection between the unhealthy conditions "red-leaf" and "leaf roll" and deterioration of black soils during the rains had been established previously. A replicated plot experiment was laid down in 1931, to discover the effects on yield, on the health of the plant and on the soil of various correctives. A specially sensitive strain of Cambodia and a mixture of six pure Malvi strains were used. The nature of sap differences in healthy and unhealthy Cambodia plants were also examined.† A paper has been prepared for publication, embodying the results of much of the work mentioned above, as well as that done in the past three years.

* Under the Gang Canal Colony cotton improvement scheme for which a special grant is made by the Indian Central Cotton Committee.

Although this investigation has been upon the relations between cotton and soil condition the results of course apply in the case of other crops in greater or less degree.

10. *Sugar-cane*.—Past work on this crop was confined to the annual growth of a small area of S. 48 variety, the cultivation being on the line of that practised in Java. S. 48 is now rapidly displacing local varieties in Central India, wherever it has been introduced by the Institute.

No tests of other varieties were made until 1932 when a replicated randomized group experiment was planted with five varieties (S. 48, Co. 210, Co. 213, Co. 281 and Co. 290) at Indore and another similar trial of five varieties (S. 48, Co. 213, Co. 244, Co. 281 and Co. 293) on the Narsingarh State Farm, with the willing co-operation of the Darbar. An examination of cultural methods has also been begun.

The relative merits of the McGlashan, Rohilkhand and *desi gur*-boiling furnaces were thoroughly tested and the economy in fuel and labour of the first named was proved, the resultant *gur* being in no way inferior to that made on the Rohilkhand system and superior to the *desi* product.

11. *Wheat*.—Wheat is grown in Malwa, both irrigated (on a relatively small area) and as a dry land crop. In area and value it is far the most important of the *rabi* crops and is one of the two staple cereals, Juar being the other. The type grown dry is almost always a *durum* or "macaroni" wheat and it commands a premium price both for export to other parts of India and for local consumption, over *vulgare* wheat such as *Pissi*, which is also grown in a few parts. It is usually very pure.

In the *rabi* season of 1931, two replicated randomized strip experiments were laid down, with the object of finding the relative yields of six standard varieties* and the Malvi *durum*, under dry land conditions. There were only slightly significant differences in yield between any of the standard varieties but several of them were definitely superior to Malvi, notably Pusa 100 and Pusa 101.

Some *durum* and *vulgare* varieties from Egypt, Iraq, Palestine, Russia and Australia were grown in single lines for preliminary test and types were isolated from bulk seed from different localities in Central India and Rajputana.

12. *Gram*.—This probably comes next to wheat in importance as a *rabi* crop. Small quantities of some 20 varieties, which had been isolated at Pusa, were tested in lines and the most promising will be taken forward to larger scale trials next *rabi* season.

13. *Linseed*.—In many parts of Central India this is a very important *rabi* crop and selection work has been begun on local seed and among types already isolated at Pusa.

14. *Other crops*.—Initial trials of several varieties of lucerne, Soya bean, berseem, Sudan grass and barley were made.

15. *Agronomy*.—The deterioration of the black cotton soils through continuous rain, already referred to, is often a factor responsible for very great reductions in yield of cotton and other crops†. To find a method of arresting this deterioration, which the cultivator would be able to adopt, is therefore a quest of prime importance. One method is to raise the soil-content of organic matter by adding farm-yard manure, but the quantity produced on an average cultivator's holding in Malwa is insufficient for more than his limited irrigated area. He cannot afford to buy other organic manures, such as oil-cakes, and if he could the supply would not be equal to the demand. Green manuring is a possibility but the land must then lie fallow and useless while the ploughed-in crop is rotting, and though the practice is known it is little used in Malwa.

*Pusa 4, 12, 52, 100, 101 and C. P. 115.

†In 1931 the yield of the cotton crop per acre in Malwa was generally estimated at 50 per cent. below normal due to this cause.

An increase in the production of farm-yard manure on the holding presents the easiest solution to the problem and the technique of the "*Indore compost process*"* worked out at the Institute during the last three years provides the means without cost other than the cultivators' labour. By utilizing various farm wastes and without precluding the traditional and almost inevitable use of cowdung cakes as fuel the production of manure from any holding can be doubled or trebled. The product is superior to most farm-yard manure in respect of nitrogen content, its availability and in the almost complete reduction of the waste materials to a stage which makes no call on soil nitrates to bring about further rotting. The process is already being actively adopted by large cultivators, and States are demonstrating its advantages in villages and on State farms.

PROPAGANDA AND EXTENSION WORK FOR STATES.

16. *Requirements.*—Any improvement in method or crop variety resulting from experimental work is of no utility until it is adopted by the cultivator as part of his normal practice. His financial resources and his general outlook impose serious limitations upon the sort of improvements he is able and willing to adopt and these limitations must always be kept in mind. To advocate something quite outside his reach is actually to do harm, as it impairs his confidence and destroys his interest.

Actual contact with cultivators on their land obviously cannot be maintained on any large scale by the Institute—that is, and must be, a function of the State Governments. The Institute's part is to supply information, to advocate and advise and to encourage and assist the States in every possible way.

This type of assistance can best be given by personal visits to States. During the year 33 such visits have been made by the Agricultural Adviser and 25 by the staff of the Institute including the newly-appointed Extension Officer.

17. *Instructional and training facilities.*—*States' officials and students.*—A number of junior or prospective agricultural employees of States has been received for periods of from one to nine months at the Institute and given general practical training. Some have come specially to learn the Indore compost process and for this *malis* and ploughmen have also been sent.

In addition a special 17-days' *Course for Revenue Officials* was held in October 1931, which 20 attended. The programme of agricultural development was explained in detail by lectures and demonstration and the enthusiastic interest shown left no doubt that Revenue Staffs can render much service by spreading information and giving friendly advice during the course of their own duties. The course received general commendation and will be held regularly in future.

The *Cultivators' Meeting*, which had been an annual feature, was held, on a somewhat diminished scale, owing to general financial stringency, in February 1932, when about 150 cultivators, including many *patels*, attended at Indore for two days, coming from seven States. Demonstrations were given to small parties at a time and in the evenings agricultural cinematograph films were shown. The scheme for a permanent camp for cultivators remains in abeyance, pending better times.

Agricultural Shows and Cattle Fairs were supported in five States; staff, exhibits and cinematograph displays being provided by the Institute and demonstrations arranged of sugar-cane cultivation, *kans* eradication, silage making, the Indore compost process, etc. A cinematograph camera and projector has been bought so that appropriate films can be prepared.

* "The Waste Products of Agriculture, their Utilization as Humus." A. Howard, C.I.E., M.A., and Y. D. Wad, M.Sc. (Oxford University Press), gives a description of the process in simple terms and an account of the experimental work leading up to it. The book may be obtained from the Institute, price, Rs. 5,

Leaflets have been issued in English and Hindi upon lucerne cultivation and the Indore compost process (1,000 copies of these two were asked for and issued) and circular letters to States drew attention to desirable activities from time to time.

Special demonstrations were arranged, by request in several States, of the construction and use of the McGlashan *gur*-boiling furnace. Trained workers have been lent to demonstrate the Indore compost process and train others. *

18. *Provision of seed, implements, etc.*—Before each sowing season every member-State was addressed, inviting the purchase for general distribution or trial of various *pure seeds of proved varieties*. Wheat, sugar-cane, lucerne, ground-nut, cotton (Cambodia and mass-selected Malvi) and some less important crops have been so distributed.

Sales of implements.—*Kans* eradicating ploughs, "Indore ridgers," two-row drills and levelling scoops have declined considerably during the year, as was to be expected. A stock of "Burdizzo" castrating instruments is now maintained and their use is constantly advocated so as to eliminate the use of inferior bulls. Many of the contributing States now employ these instruments.

19. *Special enquiries.*—Advice was sought upon the lay-out and working system for a sewage farm to deal with the effluent from the Jaipur city sewage works. A detailed scheme and report were provided.

Operation and experimental schemes were drawn up for State Demonstration and Experimental Farms in seven States and special Field Experiments have also been arranged and laid out on private lands in three States with the willing co-operation of the occupiers.

Other special advice has been asked for both by States and cultivators upon particular problems, and in several cases injudicious expenditure of capital was thereby averted.

By such means as the foregoing constant endeavour is made to maintain close relations with all contributing States and so to develop an atmosphere of confidence. Encouraging success has been achieved in this aim and, in spite of extreme financial difficulties in some States, not one has withdrawn from membership of the Institute.

Staff and Students of the Institute of Plant Industry, Indore, on June 30th, 1932.

Director .. ..	..	F. K. Jackson, N.D.A. (Hons.), Dip. Agr. (Cantab.)
Personal Assistant ..	..	Mr. A. N. Srivastava, M.Sc.
Head Clerk and Accountant ..	..	Mr. M. A. Shakoor, B.Com.
Second Clerk .. ..	..	Mr. Har Prasad.
Artist .. ..	..	Mr. S. R. Srinivasan Ayyar.
Librarian .. ..	..	Mr. Bashirhusain Khan.
Geneticist and Botanist ..	..	Vacant.
Senior Botanical Assistant ..	..	Vacant.
Plant Breeding Assistant ..	..	Mr. Kuber Singh, B.Ag.
Botanical Assistant ..	..	Mr. R. M. Ghose, M.Sc.
Research Student (I.C.C.C.) ..	..	Mr. Bhola Nath, M.Sc.
Research Student ..	..	Mr. S. R. Swarup, B.Sc. (Ag.).
Chief Assistant in Chemistry. ..	..	Mr. Y. D. Wad, M.A., M.Sc., A.I.I.Sc.
Chemical Assistant ..	..	Mr. V. G. Panse, B.Sc.
Research Student ..	..	Mr. Chironji Lal Nagar, B.Sc. (Ag.).
Research Student ..	..	Mr. V. N. Bhargave, B.Sc. (Ag.).
Research Student ..	..	Mr. R. K. Aurangabadkar, M.Sc.
Senior Farm Assistant ..	..	Mr. G. C. Tambe, B.Ag.
Farm Assistant ..	..	Mr. S. C. Talesara, B.Ag.
Junior Farm Assistant ..	..	Mr. G. G. Phadke, L.Ag.
Junior Farm Assistant ..	..	Mr. K. M. Simlote, B.Ag.
Fieldman .. ..	..	Mr. Nihal Singh.
Fieldman .. ..	..	Mr. V. R. Sathe.
Fieldman .. ..	..	Mr. E. L. Rajanna.
Storekeeper .. ..	..	Mr. Ishri Prasad.
Extension Officer ..	..	Mr. M. L. Saksena, L.Ag., F.I.S.C.

Programme of Research Work for the Year ending June 30th, 1933.

In this programme field experiments are classed by themselves because in many cases the problems they are intended to solve will be attacked co-operatively by workers in different sections.

For every field experiment a Scheme has been prepared on a standardized model; all details of lay-out, treatment or variety, agricultural operations and records to be maintained are included and the persons responsible for the conduct of the experiment are named.

Only what may be termed laboratory or pot-culture work is arranged under sections—chemical, plant-breeding or botanical.

Four distinct rotation types have been standardized and every field on the farm has been placed under one or other, so that after some years their relative advantages and convenience may be recognized by experience.

FIELD EXPERIMENTS.

Experiment

1. Manurial trials, Malvi cotton (nitrogenous manures).
- 1a. Manurial trials, Malvi cotton (compost and farmyard manure—poor land).
- 1b. Manurial trials, Malvi cotton (compost and farmyard manure—rich land).
- 1c. Manurial trials, Malvi cotton (superphosphate as a soil deterioration corrective).
2. Control of soil moisture by surface drainage.
3. Response of Malvi cotton to irrigation.
4. Effect of associated growth of cotton and legumes.
5. Effect of Kharif legumes upon a succeeding wheat crop.
6. Comparative root activity and distribution of six legume crops and their yields of seed and straw.
7. Relative economic merits of five rotations, embodying differences in crop sequences, inclusion of legumes, compost manuring and methods of tillage.
8. The economic results of different spacings of tur (*varjannus indicus*) in a juar crop and influences on a succeeding cotton crop.
9. Juar variety trial—5 types.
- 10a. Comparison of Sudan grass with juar as green fodder crops, irrigated and barani.
- 10b. Comparison of Sudan grass and natural grass as a permanent ley.
- 11a. Groundnut variety trial, manured and unmanured—poor land.*
- 11b. Groundnut variety trial, manured and unmanured—rich land.
- 11c. Comparison of effects of sowing whole, cracked and shelled groundnuts, soaked and dry.
12. The effect of different modes of winter ploughing (shallow eversion, deep eversion, inversion, sub-soiling) upon succeeding Kharif and other crops in a four-year rotation.
13. The effect of three methods of inter-cultivation of cotton and juar compared with hand-weeding only throughout a rotation.
14. Comparison of six different spacings in Malvi cotton.
15. Comparison of three types of Cambodia cotton, Cawnpore 9 and a Malvi type sown early on irrigation and sown on rains, irrigated later and not irrigated.
16. Soil uniformity test—
 - Objects :—The estimation of natural soil uniformity.
 - The same estimation as modified by grading and drainage.
 - The rise of fertility due to grading and drainage.
 - To discover the conditions governing the necessity of non-experimental borders in cultural trials.
 - To discover the most suitable size and shape of plot for field experiments under local conditions.

- 17a. Yield test of Malvi cotton selections on rich land.
- 17b. A duplicate test on well-drained but poor land.
18. Test of comparative vigour of seed from selfed cotton selections and from a mixture of the same selections grown unselfed in 1931.
19. The effect, if any, of X-ray treatment on the vigour of a strain of Cambodia cotton highly susceptible to red leaf and leaf curl under deteriorated soil conditions.

The above 26 field experiments starting in the Kharif season are arranged on the Institute Farm with replicated plots on either the randomized block or Latin square system and involve a total of 970 unit plots.

Small-scale tests of some 90 new introductions, whether crops or varieties of crops, will be sown, usually in 2 to 4 short rows. Among the more important of such subjects are the following :—Groundnut, Soya bean, Tobacco, Tur, Jowar, Sesamum and Castor.

CHEMICAL SECTION.

Soil studies.—1. Determination of properties of typical soils in Central India and Rajputana with a view ultimately to divide the region into homogeneous agricultural tracts.

2. The collection of soil profiles from the region.

3. A study of the soil of three typical fields at the Institute, embracing mechanical and chemical analysis, the movement of moisture and changes in PH values in the profile during the year and leaf sap reactions of crops growing in the soils.

4. Examination of the relative nitrifying power of some typical Malwa and Rajputana soils.

5. Investigation of the controlling influences of nitrogen supply and moisture on crops in Malwa in Field Experiments Nos. 1, 1a, 1b, 1c, 2, 3, 5, 7, 11a and 11b and the estimates (soil permeability, moisture and nitrogen content, feeding values, etc.,) associated with those experiments.

Studies on red leaf and leaf roll of Cambodia cotton, embracing investigations into composition of leaf sap and soil water.

Further developments in compost making, mainly in the directions of economy in labour and water, the investigation of the fixation of nitrogen and special adjustments of the process.

AGRONOMICAL STUDIES.

Cambodia cotton.—Preliminary culture tests to discover methods of controlling factors inducing a vigorous start to seedlings and the health of the plants.

Sugar-cane.—Small scale work on systems of cultivation, dates of planting, regulation of nutrition and moisture.

Soya beans.—Investigation of merits of soil inoculation with nodule bacteria and of application of superphosphate as a soil corrective.

Lucerne.—Study of possible improvement in system of cultivation, value of soil inoculation with a specific strain of nodule bacteria and determination of optimum stage for cutting, with analyses at different stages of growth, there being no India data.

PLANT BREEDING SECTION.

Selection work will be continued among single-plant cultures of Malvi, Bani, Roseum, Verum, some Cawnpore crosses and Cambodia cottons. The F₂ generation of crosses between the following varieties will also be subjected to selection :—

Cawnpore Roseum x Bani; Malvi x Bani; Bani x Roseum; Roseum x Malvi;
Malvi x Cawnpore Roseum.

Crossing.—A desirable early, but delicate Cambodia strain will be crossed with a hardy but late type.

The genetical relation between lint length and ginning percentage.—In this study the F₂ generation of a cross between Cawnpore 20 and Bani 13 will be examined statistically.

BOTANICAL SECTION.

Survey of Indian cottons.—Forty-three additional types have been obtained and will be sown, and selfed. As with the types already in hand detailed morphological descriptions and records with drawings will be made, including those of root types. Herbarium specimens will be mounted, also ginned and whole seeds with lint halos, and bolls preserved in formalin.

X-radiation studies.—1. Pure line seed of Malvi, Bani and Roseum cotton will be X-rayed at different dosages and sown alongside controls; morphological variations from seedling to maturity will be recorded.

2. F₁ generation seeds from a cross will be similarly treated.

3. Flower-buds and pollen of Malvi, Bani and Roseum will be X-rayed and the flowers selfed; also X-rayed pollen applied to an untreated parent. Pollen and ovules will be used in several crosses after exposure.

4. The seeds obtained from X-rayed plants in 1931 will be sown and variations in progeny noted.

5. Wheat seeds from plants X-rayed in 1931 will be sown and variations noted.

Cytological studies.—1. Material from the X-radiation studies will be examined.

2. An investigation of the development of the seed in "No lint" cotton and in Wagale is to be attempted.

FIELD EXPERIMENTS IN STATES.

With the co-operation of the Darbars concerned and in some cases of private cultivators twenty-four replicated field experiments have been arranged as follows :—

Experiment

- 20a. Yield trial of 5 Malvi strains and local cotton, on the Dhar State Farm.
- 20b. A duplicate on the Rutlam State Farm.
- 20c. A duplicate on the Narsingarh State Farm.
- 21a. Yield trial of 5 types of irrigated cotton (four of Cambodia and Cawnpore 9).
- 21b. A duplicate on the Rutlam State Farm.
- 21c. A duplicate on the Narsingarh State Farm.
- 22a. Yield trial of 4 barani cottons (Verum, Roseum 15, Banilla, Malvi) for the Nimar tract on the estate of Seth Bhanwar Lal Sethi at Sanawad, Holkar State.
- 22b. A duplicate on the estate of V. S. Khode, Esq., B.A., LL.B., vakil, at Khargone, Holkar State.
- 22c. A duplicate on land in Dhar State arranged by the Agricultural Superintendent, Dhar.

*Jaipur.**Experiment.*

1. Comparative studies on Cambodia, Punjab 289F and Malvi cottons under different systems of cultivation.
2. Yield trial of groundnut varieties.
3. Bajra and Tur spacing test.

The above are to be on the Jaipur State Farm.

Bharatpur.

1. Yield trial of four varieties of barani cottons (Cambodia, Cawnpore 520, Rosea, Bhatla and Mollisoni).
2. Yield trial of four varieties of irrigated cotton (two Cambodia types, Cawnpore 402 and Cawnpore 9).
3. Yield trial of groundnut varieties.

The above are to be on the Bharatpur State Farm.

4. } Scheme No. 1 will, it is hoped, also be carried out on three other types of
5. } land in the State.
6. }

Bikaner.

1. Yield trial of five cotton varieties (Punjab 289F, Cawnpore 402, Cawnpore 520, Sanguineum, N.T. 12 and Mollisoni).
2. Yield trial of three cotton varieties (Acala, Early American, N.T. 39, Roseum, N.T. 10).
3. Single plot trials of twelve cotton varieties.
4. Irrigation test—frequency and quantity—on Mollisoni cotton.
5. Duplicate on Punjab 289F cotton.
6. Date of sowing test on Mollisoni cotton.
7. Manurial test, legume green manure and compost.

The above are on the Ganganagar Farm of Bikaner State, in the Gang Canal Colony, under the special scheme of the Indian Central Cotton Committee.

RABI CROP EXPERIMENTS.

The detailed Field Experiment Schemes for *rabi* crops have not yet been prepared. They will include yield trials of barani and irrigated wheat and probably of gram and linseed.

Those of the Field Experiments begun in the Kharif season which are continuous for several years will of course be in operation.

APPENDIX III.

INSTITUTE OF PLANT INDUSTRY, INDORE.

GENERAL PROGRAMME OF COTTON RESEARCH.

(Revised and extended, July 1932.)

SINCE the initial programme of cotton investigations was drawn up in 1923 the activities of the Institute (which started operations in 1925) have developed and cover a much wider territory.

In addition to Central India this now includes all types of soil and climate in Rajputana, e.g., the arid sandy areas of Bikaner, the somewhat less arid State of Jaipur, the borders of the Jumna valley in Bharatpur and the zone typified by Bundi and Tonk States. The area dealt with in Malwa proper and the low-lying tracts adjoining the Central Provinces and Bombay Presidency has also grown in size by the adherence of new States as well, also, as in Bundelkhand, which again is distinct in agricultural character. Hence a greater variety of problems in cotton cultivation now present themselves and this tendency will continue as more States join the Institute.

The Indian Central Cotton Committee has also recently expressed its desire that the original programme of cotton investigations should be developed and extended.

For these reasons it has become necessary to revise and extend that programme although its main lines are still maintained. The items are not to be regarded as forming a rigid and limiting basis of work; in all scientific research glimpses into unknown and attractive country are afforded from time to time and exploration must be permitted.

(a) BOTANICAL SURVEY.

Up to the present, little or no attempt has been made in India to isolate, classify and study the unit species which form the framework of the various species and varieties of cotton. It is true that the Indian cottons have been classified and surveyed from the point of view of systematic botany, but this is entirely inadequate for modern work as by this method cottons of very different agricultural value are not distinguished. This work has a direct practical bearing. It will, in all probability, lead to the isolation of useful types for distribution. It will also provide material for the plant-breeder and for critical work on the physiology and agronomy of cotton. In addition a revision of the present systematic classification of cottons will be considered, the collection of types already amassed providing good material for comparative studies.

(b) COTTON BREEDING AND SELECTION—ECONOMIC.

(i) The creation, establishment and maintenance of an island of improved cotton on the Malwa plateau. The types isolated will be available for other areas in India and the crop will enable a grade of improved cotton to be established for the mills and for the shippers.

(ii) The introduction of a pure and improved early-ripening, hardy cotton for the low-lying tracts of Central India.

(iii) The discovery of the most profitable cotton to be grown in the new Gang Canal Colony, Bikaner.

(iv) The selection of a pure improved cotton or cottons to replace the mixtures grown in other parts of Rajputana and in Bundelkhand.

(c) COTTON GENETICS.

The mode of inheritance of characters in cottons will be studied. Many problems await investigation ; among them one of the most important is the genetical relationship between the factors determining lint length and ginning percentage with the associated variations in yield.

The effects of exposing cotton seeds, buds and pollen to X-Rays and radium emanations will be investigated with a view to producing mutants of economic value. It has been found by several workers in recent years that such treatments have the effect of violently disturbing the arrangement of chromosomes and even of genus in the germ cells and consequently producing types differing widely from the parent. The possibility of thus producing new types of economic value has hardly been touched as the whole subject is in its infancy and an entirely new field of unknown possibilities is awaiting exploration. Both these studies will also involve cytological work.

(d) THE PHYSIOLOGY OF THE COTTON PLANT.

In order to increase production something more than improved varieties is needed. The new varieties must be provided with suitable conditions for growth. To discover these, the physiology of the cotton plant must be studied and the factors which now limit production must be determined. This involves the study of root-development, the relations of the root-system to the soil type and the influence of factors, such as soil moisture, soil-aeration and drainage, soil texture and soil temperature, on growth. Included in these studies is the discovery of the factors which produce the shedding of buds, flowers and bolls. The general nutrition of the cotton plant will also be considered and how far the yield can be improved by manuring and other methods of soil treatment.

In the course of these studies many more types of soil are now involved than those of the Malwa plateau and accordingly a collection of soil profile samples will be made from different parts of the area covered. Mechanical analysis and other examinations will be made so that the behaviour of cotton may be correlated with their characteristics.

(e) THE INFLUENCE OF ENVIRONMENTAL FACTORS IN THE LINT CHARACTERS.

Modern industries demand a uniform product. Once this is obtained, the purchase of raw material as well as the details of manufacture are simplified. In the case of cotton, any tract which can produce uniform lint will rapidly establish its reputation in the trade. It is well known, however, that the cotton fibre alters in character according to the soil on which it grows and to some extent according to the season. Further work is desirable on this matter with the object of discovering what factors bring about these changes, which varieties are most easily affected and whether any practical remedies exist for improving the uniformity of the fibre of the same cotton. This portion of the work is of direct bearing on the question of the maintenance of grades of cotton for the highest class of spinning in this country. It is hoped to resume this piece of work on somewhat more intensive lines than those previously adopted.

(f) FIELD EXPERIMENT TECHNIQUE.

With the exception of preliminary trials all field experiments involved by the programme will be laid out either on the replicated Randomized Block or the Latin Square system as elaborated at the Rothamsted Experimental Station or with such later developments as seem desirable to adopt. Modern developments in statistical mathematics will be used in interpreting results.

APPENDIX IV.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by Mills in British India, and on Voluntary Returns from 3r Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.
Bombay Island ..	762,610	987,355	731,937	747,988	435,426	542,086	766,375	664,546	610,288
Ahmedabad ..	262,745	273,639	286,800	264,139	298,075	318,983	344,021	321,503	322,257
Bombay Presidency ..	1,180,410	1,424,447	1,180,589	1,167,892	894,671	1,044,925	1,300,859	1,173,659	1,131,327
Madras	149,721	162,876	176,274	185,207	194,591	204,284	211,488	214,759	200,707
United Provinces ..	160,522	177,064	191,740	204,702	170,846	182,462	234,205	235,623	256,820
Central Provinces and Berar	94,635	106,052	109,995	111,292	116,888	121,391	123,146	118,492	115,018
Bengal	72,535	83,553	77,949	89,763	82,086	84,212	99,075	91,993	102,390
Punjab and Delhi ..	23,388	30,663	35,394	40,687	45,638	54,575	64,464	73,736	89,681
Rest of British India ..	12,227	14,414	17,313	13,190	15,040	22,189	24,458	27,101	30,342
Total—British India..	1,693,438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,695	1,935,363	1,986,285
Total—Indian States..	142,505	175,609	187,614	229,443	251,589	277,540	315,399	333,996	358,792
Total—India ..	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,373,094	2,269,359	2,345,078

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from or *Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

—	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.
Hyderabad ..	15,210	16,697	19,067	20,823	23,074	31,290
Mysore	43,571	44,320	39,619	46,590	43,326	49,293
Baroda	46,070	46,884	48,852	59,043	62,578	58,534
Gwalior	24,257	25,716	36,708	41,463	45,207	45,892
Indore	53,526	65,391	76,070	83,026	88,620	95,296
Other Indian States	46,809	52,581	57,224	64,454	71,191	78,488
Total ..	229,443	251,589	277,540	315,399	333,996	358,793

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

—	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.
Bombay	28,328	24,970	27,324	24,361	54,409	74,979
Madras	35,198	39,560	52,188	46,582	55,717	99,389
United Provinces ..	16,991	10,308	13,878	20,441	18,496	12,572
Central Provinces and Berar ..	40,762	20,861	6,924	16,243	15,771	20,743
Punjab	3,910	4,739	3,760	4,361	4,307	2,317
Total ..	125,189	100,438	104,074	111,988	148,700	210,000

APPENDIX V.

Subject.—ENQUIRY INTO THE COTTON TEXTILE INDUSTRY.

Copy of letter No. 168, dated the 22nd April 1932, from the Secretary, Tariff Board, Bombay, to the Secretary, Indian Central Cotton Committee, Bombay.

In connection with the Tariff Board enquiry into the Cotton Textile Industry, I am directed to ask that you will be good enough to supply the Board with information on the points noted below :—

- (i) Please refer to paragraph 81 and Appendix XIII of the Report of the Indian Tariff Board, 1927, and your Committee's pamphlet on Cotton Improvement in India, 1931, Chapter V. What is the present available supply of long-staple cotton in India? What is the net supply available for use in Indian mills? What are the counts of yarn in the manufacture of which Indian long-staple cotton may be used?
- (ii) To what extent is the raw cotton now imported into India of the same quality as Indian long-staple cotton? Does the present import duty on raw cotton materially help the Indian cultivator?
- (iii) Does the present position of the world's cotton crops justify the assumption that there is overproduction? If so, can it be argued that a decline in the output of the Indian mills will adversely affect the Indian cultivator of cotton? This of course assumes that the countries to which Indian cotton is now exported may obtain increasing supplies of short-staple cotton from other countries. It is in fact suggested that such a tendency is already noticeable, especially in the case of Japan.

2. I am to request that the reply to this letter (with six spare copies) may be sent as early as convenient, if possible not later than the 15th of June.

REPLY.

Subject.—ENQUIRY INTO THE COTTON TEXTILE INDUSTRY.

Before answering the specific questions asked in the letter of the Textile Tariff Board it would be as well to give a short history of the Indian cotton crop since the 1925-26 season when the Committee supplied a note to the previous Board.

It has to be realised at the outset that the year 1925-26 was a record one in the history of Indian cotton, the estimated production (final figures) being 6,215,000 bales, which is 127,000 bales more than the previous recorded figure of 6,088,000 bales in 1924-25, and 2,151,000 bales more than the estimated production of the current season. During the season 1925-26, the short-staple and all varieties of long-staple crops fared very well, but since then there has been no year in which one or other of the long-staple varieties has not been affected by the vagaries of the season. Further, the low prices of 1925-26 were largely responsible for the sharp decline in the total area sown from 28.4 million acres in 1925-26, to 24.8 million in 1926-27. This level was maintained in 1927-28, and the area then rose to 27.1 million in 1928-29, fell to 25.9 million in 1929-30, and as a result of low prices in that season again fell to 23.8 million in 1930-31, and 23.5 million in 1931-32. It will thus be seen that both unseasonable weather conditions and reduced area are responsible for the small crops since 1925-26.

The form of the statement defining long and short staple cotton sent in 1926 by the Committee to the Tariff Board was taken from the classification adopted in Annexure II of the Report of the Indian Cotton Committee of 1919 and in order to make the present-day figures comparable with those submitted to the previous Board, the same classification has again been adopted. Cotton $\frac{3}{8}$ " and over has been classified as long staple while

cotton up to 13/16" has been taken as short staple. For mill purposes, however, many of the types included in the long-staple class, due to unevenness in staple or lack of strength, fall short of the definition of long-staple cotton given below, viz., that capable of spinning 24s warp counts and above. We therefore attach a second statement showing the quantity of commercial long-staple cotton grown in India, i.e., those qualities capable of spinning 24s warp counts and above.

Questions.—1 (a).—What is the present available supply of long-staple cotton in India?

1 (b).—What is the net supply available for use in Indian mills?

Answers.—My Committee is not quite sure what is meant by the word 'available' in the first question. A particular cotton may be available in so far as it may be grown, but it may be unobtainable by the mills because, for one reason, of the malpractice of mixing in the intermediate stage of marketing. Nearly 85 per cent. of the Punjab-American crop in the Punjab is sold by the grower with a maximum amount of approximately 10 per cent. mixture of *desi* cotton, but owing to mixing during the process of marketing the same amount of staple cotton is not available to the trade. My Committee therefore prefers to answer the first two questions 1 (a) and 1 (b) by giving in two tables firstly, the total amount of long-staple cotton *produced* in the country and secondly, by furnishing an estimate of the amount of commercial long-staple cotton available for consumption. In the latter case only those types capable of spinning 24's warp counts and above are included. A cotton may be $\frac{3}{4}$ " in length but may still be incapable of spinning 24's and is thus excluded from the second table, though it may be found under the long-staple classification in the first table.

TABLE I.
Indian Cotton Crops classified by staple lengths.
(In thousands of bales of 400 lbs. each.)

	1931-32 (as estimated in the forecasts).
LONG STAPLE—$\frac{7}{8}$ inch and above.	
<i>Oomras—</i>	
Hyderabad Gaorani	115
Verum 262	20
<i>Broach—</i>	
Surat-Navsari, mostly 1027 A. L. F. (Staple 1")	103
Others	120
<i>Kumpta-Dharwar—</i>	
Gadag 1 (Staple 1")	13
Jayawant (Staple 1")	12
Others	224
<i>Westerns and Northerns—</i>	
Hagari 1 (Staple $\frac{7}{8}$ ")	28
Nandyal 14 (Staple 15/16" to 1")	2
Others	191
<i>Tinnevellys—</i>	
Karunganni C-7 (Staple 1")	} 140*
Karunganni, others (Staple $\frac{7}{8}$ ")	
Others	
<i>Cambodia—</i>	
Coimbatore-2 (Staple 1")	32
Irrigated Cambodia (Staple 1")	59
Others	30
<i>Punjab and Sind-Americans—</i>	
289-F (Staple 1" to 1-1/16")	} 231*
4-F (Staple $\frac{7}{8}$ ")	
Total—Long Staple	1,320
SHORT STAPLE—Below $\frac{7}{8}$ inch.	
<i>Oomras (part)</i>	1,188
<i>Broach (part)</i>	57
<i>Dholleras</i>	577
<i>Bengals</i>	785
<i>Salems</i>	36
<i>Cocanadas</i>	34
<i>Comillas, Burmahs, etc.</i>	67
Total—Short Staple	2,744
Grand Total	4,064

* Separate figures not yet available.

Over a period of ten years previous to the present season, the average of long-staple cotton to the total crop has amounted to 26.7 per cent. so that it can be taken that roughly one-fourth of the Indian crop is long staple.

TABLE II.

Classification of long-staple Indian cottons capable of spinning 24's standard warp counts and above.

(In thousands of bales of 400 lbs. each.)

LONG STAPLE— $\frac{7}{8}$ inch and above.										(As estimated in the forecasts.)
<i>Oomras—</i>										
Hyderabad Gaorani	..	..	..	..	..	..	..	..	115
Verum 262	..	..	..	..	..	..	..	..	20
<i>Broach—</i>										
Surat-Navsari, mostly 1027 A. L. F. (Staple 1")	..	..	..	..	..	..	..	..	70
<i>Kumpta-Dharwar—</i>										
Gadag 1 (Staple 1")	..	..	..	..	..	..	..	..	13
Jayawant (Staple 1")	..	..	..	..	..	..	..	..	12
Kumpta and Dharwar-Americans	..	..	..	..	..	..	..	..	75
<i>Westerns and Northerns—</i>										
Hagari 1 (Staple $\frac{7}{8}$")	..	..	..	..	..	..	..	..	28
Nandyal 14 (Staple 15/16" to 1")	..	..	..	..	..	..	..	..	2
Others	..	..	..	..	..	..	..	..	81
<i>Tinnevellys—</i>										
Karunganni C-7 (Staple 1")	}		..	..	..	..	..	..	140*
Karunganni, others (Staple $\frac{7}{8}$")			..	..	..	..	..	..
Others		
<i>Cambodia—</i>										
Coimbatore-2 (Staple 1")	..	..	..	..	..	..	..	..	32
Irrigated Cambodia (Staple 1")	..	..	..	..	..	..	..	..	59
Others	..	..	..	..	..	..	..	..	30
<i>Punjab and Sind-Americans—</i>										
289-F (Staple 1" to 1-1/16")	..	..	..	..	..	..	..	..	8
4-F (Staple $\frac{7}{8}$")	..	..	..	..	..	..	..	..	50†
Total long staple										735

* Separate figures not yet available.

† Contains up to 10 per cent. mixture.

The quantity of Indian long-staple cotton available to Indian mills for spinning the higher counts is not necessarily that given in the above table for the following reasons.—

- (1) It may not be economic for every mill in India to use only Indian cotton for spinning counts above 24's.

- (2) The mills spinning higher counts are not all concentrated in areas growing superior types of cottons.
- (3) The mills in such areas and inefficient mills may waste superior types in spinning lower counts.
- (4) Some quantity of long-staple cotton is used in hand spinning and for domestic purposes.
- (5) A portion of the long-staple crop is exported.

No estimate of the first four factors is possible but the amount of long-staple cottons exported from India is ascertainable. The bulk of the long-staple cotton exported from India may be taken to be that grown in Madras Presidency. Last year this amounted to 70,000 bales which may be taken as a fair average. If, therefore, the first four factors are ignored, the quantity of long-staple cottons produced in India and available for use in Indian mills amounts this year to 6.65 lakh bales.

*Question 1 (c).—*What are the counts of yarn in the manufacture of which Indian long-staple cotton may be used ?

Answer.—24's to 32's warp and 26's to 40's weft counts.

*Question (ii) (a).—*To what extent is the raw cotton now imported into India of the same quality as Indian long-staple cotton ?

Answer.—Below will be found a statement showing the quantities and staple lengths of American, Egyptian and East African cottons imported into India during the last 2½ years. The only cottons which can be said to compete effectively with Indians are those between ¾" and 1" in length. Except for a crop of 8,000 bales of 1-1/16" staple grown in the Punjab, India does not so far produce any cotton of greater staple than 1". It will be seen from the table that the bulk (70 per cent.) of the American cotton imported competes with Indian styles while from Egypt and Africa is imported cotton not grown in India and therefore not competitive.

STAPLE LENGTHS OF IMPORTED COTTONS.

(From 1st September 1929 to 1st May 1932.)

TABLE III.

Americans.

Staple length.	Total No. of Bales.				
Below ¾"	1,000				
¾"	33,810				
29/32"	53,705				
15/16"	91,190				
31/32"	28,038				
1"	8,785				
1-1/32"	11,150				
1-1/16"	28,800				
1-3/32"	13,085				
1-1/8"	14,900				
1-5/32"	200				
Total	284,663				
		<i>Actual Imports.</i>			
		Bales.			
		1929-30	..	..	12,759
		1930-31	..	..	128,845
		Up to 1st May 1932	..	..	168,475
		Total	..	..	310,079

TABLE IV.

Egyptians and East Africans.

				TOTAL NO. OF BALES.		Remarks.
				Egyptians.	East Africans.	
1"	..	..	....		2,200	* Staple 1-1/16" to 1-3/16"
1-1/32"	..	..	....		.
1-1/16"	..	..	3,875		700	
1-3/32"	..	..	100		..	
1 1/8"	..	..	2,981		..	† Staple 1 1/8" to 1 1/4"
1-5/32"	..	..	..	*5,475	*52,167	‡ Staple 1-9/32" to 1 1/2"
1-3/16"	..	..	3,740	†8,100		
1-7/32"	..	..	..	-2,300		
1 1/4"	..	..	6,968			§ Staple over 1 1/2"
1-9/32" to }	..	..	..	§1,195		|| Staple 1" to 1 1/8"
1-15/32" }	..	..	955			
1 1/2"	..	..	4,997			
Total	..			40,686	79,067	

Actual imports (in 3 1/2-cwt. bales).

1929-30	..	..	..	12,387	134,533
1930-31	..	..	..	148,947	179,473
Up to 1st May 1932	..	..	..	94,226	73,580
Total	..			255,560	387,586

N.B.—The figures of imports of foreign cotton given above have been supplied through the courtesy of importers. From 1st September 1929 to 30th April 1932, 310,079 bales of American cotton were imported, and information regarding their staple lengths has been furnished voluntarily for 92 % of that quantity.

The reason for the meagre information supplied concerning Egyptian and East African cottons is that some importers have not replied to our request for information and some have not kept a record of the staple lengths of the bales imported by them.

Question (ii) (b).—Does the present import duty on raw cotton materially help the Indian cultivator ?

Answer.—The bulk of the Indian crop being short staple, there is no competition from outside sources with cotton less than 3/4", so that the imposition of an import duty on this type of cotton can have had no effect on the majority of the Indian growers of cotton. There is also no competition in India with cottons over 1" in staple except for the 8,000 bales of 289F of 1-1/16" staple grown in the Punjab. We understand, however, that there may be a great future for cottons of this staple in Sind and the Punjab. For the effect of the duty on the intermediate staples between 3/4" and 1", there is only the experience of the past eight months to fall back on and this has been a period in which abnormal factors have predominated in the world's markets, e.g., a big and high-class American cotton crop being dumped on the world's markets, and the general trade depression. It is therefore difficult to say to what extent the grower of staple cotton in India has benefited by the duty during this period but under normal conditions and circumstances an import duty on cotton should afford protection to the grower of these staples.

Question (iii) (a).—Does the present position of the world's cotton crops justify the assumption that there is overproduction?

Answer.—Yes, in the respect that for the present the supply is greater than the demand.

Question (iii) (b).—If so, can it be argued that a decline in the output of the Indian mills will adversely affect the Indian cultivator of cotton?

Answer.—Yes, it is certainly so in regard to cotton from $\frac{3}{8}$ " to 1" because the export demand in regard to such cotton is entirely dependent on its cheapness in comparison with American. What ensures a reasonable price to the grower of such cottons is the Indian mill demand. This was clearly brought out during the seasons 1926-28, when large quantities of cheap low grade American cotton were imported to replace Indian cotton. The position therefore is that a part of the Indian cotton crop, varying from 1 to 2 million bales, will, if not taken up by Indian mills, be dumped on the export market and thus depress it. It can therefore be presumed that a decline in the output of Indian mills will adversely affect the price of Indian cottons of $\frac{3}{8}$ " to 1" staple. Past experience also shows that in time of strike in the mills in Bombay and Ahmedabad the general tone of the home markets has not been altogether wholesome. In regard to cottons below $\frac{3}{8}$ " there is also a danger of such an adverse effect taking place when a short output of Indian mills coincides with an increase of short-staple American cotton due to deterioration.

Question (iii) (b) 2.—Does the Indian cultivator normally get a lower nett price for cotton exported than for cotton sold to mills?

Answer.—No. The conditions in the markets are such that the grower gets the best price for his produce owing to competition between buyers whether for export or home consumption. The highest bidder obtains the cotton, and as roughly half the crop is exported and half used in the country, it is safe to assume that there is no differentiation in rates.

APPENDIX VI.

Subject.—USE OF LONG-STAPLE COTTON BY INDIAN MILLS

Copy of letter No. 363, dated the 21st September 1932, from the Secretary, Indian Central Cotton Committee, Bombay, to the Secretary, Indian Tariff Board.

During the course of the oral evidence tendered by the representatives of the Indian Central Cotton Committee, it was suggested by the President of the Board that there was a wastage of wealth owing to the practice of using long-stapled Indian cotton for the production of yarns of lower denominations than the cotton was actually suited to spin, and that on this account either the mills or the cultivators of cotton suffered. The proposition enunciated by the President of the Board required detailed examination and the representatives of the Indian Central Cotton Committee therefore asked to be given an opportunity of examining it more closely. This further examination has now been completed, and I have the honour to submit the considered views of my Committee on this matter. In studying the situation, the representatives of my Committee had the benefit of the consultation with the representatives of the East India Cotton Association, the Millowners' Association, Bombay, and the Millowners' Association, Ahmedabad, and the opinions hereafter expressed on the remark of the President, Tariff Board, represent the agreed views of all these interests.

2. On the general proposition as to whether cotton growers suffer any financial loss on account of mills in India using Indian staple cottons at times for production of counts lower than the maximum counts which such cottons are capable of spinning, there is complete agreement that full market rates are invariably paid for all cotton purchased from the grower, including staple cottons, irrespective of the uses to which such cottons may be put. Therefore, whether cotton bought by mills is used for the purpose of spinning higher or lower counts, the agriculturist does not suffer by mills in India spinning lower counts than the maximum counts that can be spun out of such cotton. The conclusion of the Associations on whose behalf this reply is being sent unequivocally is that no financial sacrifice or waste is made at the expense of the agriculturist in this connection. Whether mills in India in every instance make the fullest economic use of the staple cottons which they purchase, is, therefore, the only question which remains to be examined and I have the honour to submit that this question can be more properly dealt with by the representatives of the millowners in India, should the Tariff Board refer it to them. As far as the Indian Central Cotton Committee is concerned, their direct and main interest is the interest of the cotton grower and if the first proposition named in this paragraph is not challenged by the Tariff Board, I feel that I may leave this question at this point whilst dealing with the question raised by the President.

3. As regards the manner in which the long-staple cotton crop is utilized, the results of my Committee's further investigations are stated below. In Appendix (A) will be found a statement showing the production of Indian cotton suitable for spinning 24's counts and above. This table has been drawn up on the same basis as Table II of my Committee's written evidence to the Board, and shows that the average production for the three cotton seasons 1929-32, was 714,000 bales of 400 lbs. weight. The whole of this cotton, however, was not available for commercial purposes. A portion was utilized for hand-spinning and other domestic purposes. When considering the whole of the Indian cotton crop of five to six million bales, it is generally accepted that 750,000 bales—about 15 per cent. of the crop—are used for domestic purposes. Assuming that the proportion of staple cotton used for domestic purposes is the same as for other types, then 15 per cent. of 714,000 bales, i.e., 107,000 bales, would be consumed locally leaving 607,000 bales for export and mill consumption.

4. With regard to the exports of the particular class of cotton under consideration it has to be pointed out that the seaborne trade statistics compiled and published by the Director-General of Commercial Intelligence and Statistics, which is the only *complete statistics for exports of cotton from India*, does not distinguish between the different varieties of cotton. There is, however, another set of statistics which is helpful. Through the

courtesy of a number of exporting houses the Indian Central Cotton Committee have been able to collect details of exports to different countries classified according to the usual trade descriptions on the definite understanding that figures relating to individual firms would not be divulged to the public. These figures are given in Appendix (B), and they show that the total average exports from India during the seasons 1929-31 were as follows :—

	Bales.
Hyderabad Gaorani (whole)	39,000
Tinnevellies (whole)	56,000
Cambodias (whole)	55,000
Westerns and Northern * (half)	30,000
Kumpta-Dharwar * (one-third)	2,000
Broach * (less than a third estimate)	25,000
Punjab-American † (one-tenth estimate)	42,000
Total ..	<u>249,000</u>

N.B.—Figures for 1931-32 are not yet available.

From these figures it may be inferred that *not less than* 2.49 lakhs bales of long-staple cotton were exported, leaving only 3.58 lakhs for consumption in Indian mills.

5. The words "*not less than*" are used here advisedly, because the returns received by the Indian Central Cotton Committee from exporters in this connection did not account for the entire exports from India of Indian cotton as published by the Director-General of Commercial Intelligence and Statistics. There is, therefore, every reason to believe that the above figures are, if anything, on the low side.

6. The next point for consideration is whether the whole of this long-staple cotton was absorbed by Indian mills. As there was general agreement amongst the representatives of the various bodies referred to by me, that there were no reports of unsaleable quantities of staple cottons during the seasons referred to, they believe that it is justifiable to infer that the long-staple cottons available in India were absorbed by mills in India. On the other hand, it is the general experience of mills that owing to scarcity the premiums which have to be paid for staple cottons increase in July, August and September.

7. The last point to be examined is whether the staple cotton which was absorbed by the mills was properly utilized, in other words, whether it was utilized in the production of finer count yarns. In the written evidence submitted to the Board by the Indian Central Cotton Committee, it was indicated that mills situated in areas in which long-staple cotton is grown sometimes find it convenient to spin from staple cotton yarns of counts lower than those for which the cotton grown in the vicinity is suited. In this connection, it is necessary to bear in mind that cotton suitable for lower counts from other areas is comparatively more costly to such mills owing to the heavy cost of railway freight which such short-staple cotton has to bear for import into these areas. To what extent staple cotton was spun into counts lower than it was capable of spinning may now be examined. In Appendix (C) will be found a table showing India's yarn production during the last ten years classified according to counts. In Appendix (D) the calculated quantities of raw cotton, Indian and foreign (at 1 lb. of yarn = 1.18 lbs. raw cotton) as worked out in Appendix (E) necessary for the production of counts 24's and above are given separately. Consideration of these two tables shows that on the average of the last three years 398,000 bales of staple cotton must have been used in the production of 24's and above. This figure is reasonably close to the estimated figure of 358,000 bales of suitable staple cotton available to the mills taking into consideration the obvious shortcomings of our statistical data and other evidence available. It would not therefore be incorrect to infer that staple cottons are on the whole put to proper use by Indian mills bearing in mind the location of Indian mills as referred to above.

* On the same basis as Appendix (A).

† Only a rough estimate.

APPENDIX (A).

Classification of long-staple Indian cottons capable of spinning 24's standard warp counts and above.

(In thousands of bales of 400 lbs. each.)

LONG STAPLE— $\frac{3}{8}$ inch and above.					(As estimated in the forecasts.)		
					1931-32.	1930-31.	1929-30.
<i>Oomras—</i>							
Hyderabad Gaorani	..	..	..	} (Entire crops.)	115	126	125
Verum 262	..	..	..		20	11	7
<i>Broach—</i>							
Surat-Navsari, mostly	1027	A.L.F.					
(Staple 1")	..	..	..	(Estimated round figure.)	70	70	70
<i>Kumpta-Dharwar—</i>							
Gadag 1 (Staple 1")	..	..	..	..	13	11	16
Jayawant (Staple 1")	..	..	..	..	12	7	10
Kumpta and Dharwar-Americans	..	($\frac{1}{3}$ of $\frac{2}{3}$ the remaining crop.)			75	33	86
<i>Westerns and Northerns—</i>							
Hagari 1 (Staple $\frac{3}{8}$")	..	..	..	} (Half of the total crop.)	24	91	86
Nandyal 14 (Staple 15/16" to 1")	..	..	..		2		
Others	..	..	..		81		
<i>Tinnevellys—</i>							
Karunganni C-7 (Staple 1")	..	..	..	} (Entire crop.)	140	129	162
Karunganni others (Staple $\frac{3}{8}$")	..	..	..	
Others	..	..	..	
<i>Cambodia—</i>							
Coimbatore-2 (Staple 1")	..	..	..	} (Entire crop.)	32	90	144
Irrigated Cambodia (Staple 1")	..	..	..		59		
Others	..	..	..		30		
<i>Punjab and Sind-Americans—</i>							
289-F (Staple 1" to 1-1/16")	..	..	..	} (Entire crop. Estimated round figure.)	8	12	2
4-F (Staple $\frac{3}{8}$")	..	..	..		50*	50*	50*
Total long staple					735	650	758
Total for 3 years					2,143		
Average					714		

* Contains up to 10% mixture.

APPENDIX (B).

EXPORTS OF LONG-STAPLE COTTON FROM INDIA.

(In thousands of bales.)

Year ending 31st August	Hyde- rabad Gaorani	Punjab- Ameri- can.	Sind- Ameri- can.	Broach.	Kump- ta- Dhar- war.	West- erns & North- erns.	Tinne- velles.	Cambo- dias.	Total.
1931-32 ..									
1930-31 ..	24	418	34	81	2	44	42	45	690
1929-30 ..	54	419	17	88	9	75	70	65	797
1928-29 ..	44	328	10	59	23	70	76	17	627
1927-28 ..	18	314	..	166	17	28	54	..	597
1926-27 ..	11	252	..	112	1	10	46	2	434
1925-26 ..	20	496	..	210	20	87	92	17	942
1924-25 ..	5	365	..	285	35	83	117	67	957
1923-24 ..	53	253	..	241	38	49	130	60	824
1922-23 ..	5	91	..	262	23	42	26	36	485

APPENDIX (C).

YARN PRODUCTION IN INDIA.

For years ending 31st March.

(In millions of pounds.)

Year end- ing 31st March	C O U N T S .						Waste.	Total.
	1-10.	11-20.	21-23.	24-30.	31-40.	Above. 40.		
1931-32 ..	117	445	129	165	71	34	5	966
1930-31 ..	114	400	115	144	61	27	6	867
1929-30 ..	106	388	127	145	46	15	7	834
1928-29 ..	79	303	97	116	37	10	6	648
1927-28 ..	106	389	122	141	34	11	6	809
1926-27 ..	115	401	113	135	28	11	4	807
1925-26 ..	96	349	98	116	20	6	1	686
1924-25 ..	93	377	102	122	19	6	*	719
1923-24 ..	85	327	82	100	20	3	*	617
1922-23 ..	103	376	98	111	16	2	*	706

* Less than a million pounds.

APPENDIX (D).
RAW COTTON CONSUMED IN INDIAN MILLS.
(In thousands of bales of 400 lbs. nett.)

Year ending 31st March	Calculated (1 lb. yarn=1.18 lbs. raw cotton) quantity of raw cotton required to spin the yarn produced in India.				Net imports of foreign cotton.*	Indian cotton used for producing yarn 21's and above.
	24-30	31-40	Above 40	Total.		
1931-32 ..	487	209	100	796	443	353
1930-31 ..	425	180	80	685	327	358
1929-30 ..	428	136	44	608	126	482
Total ..	..	..	..	..	..	1,193
Average ..	..	..	..	..	..	398

* Imports of foreign cotton less re-exports.

APPENDIX (E).
Calculation of waste percentage ratio from known cotton consumption and yarn production.
(In thousands of bales of 400 lbs.)

Year ending 31st March	Indian cot- ton con- sumed in Indian mills. (a)	Foreign cotton imported into India. (b)	Total cot- ton taken by Indian mills.	Yarn Pro- duction (in millions of pounds) ex- cluding waste.	REMARKS.
1931-32	2,342	443	2,785	961	(a) Figures compiled by the Indian Central Cotton Committee from cotton cess returns from British Indian mills and voluntary returns from Indian State mills.
1930-31	2,266	327	2,593	861	
1929-30	2,248	126	2,374	827	
1928-29	1,764	159	1,923	642	
1927-28	1,984	354	2,338	803	
1926-27	2,159	244	2,403	803	(b) It cannot be as- sumed that cotton imported during any year is consumed in the same year, but over a number of years the difference caused by this factor will not be appreci- able.
1925-26	2,007	53	2,060	685	
1924-25	2,051	47	2,098	719	
1923-24	1,798	33	1,831	617	
Total ..	18,619	1,786	20,405	6,918	

For all nine years, total cotton taken by mills = 20,405,000 bales.
= 8,162,000,000 lbs.
Do. total yarn production = 6,918,000,000 lbs.
∴ 1 lb. yarn = 1.1798 lbs. cotton.
For last two years, total cotton taken by mills = 5,378,000 bales.
= 2,151,200,000 lbs.
Do. total yarn production = 1,822,000,000 lbs.
∴ 1 lb. yarn. = 1.4806 lbs. cotton.
Hence the general average may be taken as 1 lb. yarn=1.18 lbs. cotton.

APPENDIX VII.

THE CENTRAL PROVINCES COTTON MARKET ACT, 1932.
(No. IX of 1932).

An Act to provide for the establishment and better regulation of cotton markets in the Central Provinces.

WHEREAS it is expedient to provide for the establishment and better regulation of the
Preamble. recognized open markets for the purchase and sale of cotton in the
Central Provinces ;

And whereas the previous sanction of the Governor-General required by sub-section
(3) of section 80-A of the Government of India Act and the previous sanction of the Governor
required by section 80-C of the said Act have been obtained for the passing of this Act;

It is hereby enacted as follows :—

- Short title. 1. This Act may be called the Central Provinces Cotton Market Act, 1932.
- Extent. 2. This Act shall apply to the whole of the Central Provinces.
- Definitions. 3 In this Act, unless there is anything repugnant in the subject or context,—
- " Cotton." (i) " cotton " includes ginned as well as unginned cotton ;
- " Cotton market " (ii) " cotton market " means a market established under section 4 of this Act ;
- " Grower of cotton." (iii) " grower of cotton " shall not include a dealer or broker in cotton, although such a person may grow cotton. If a question arises whether any person is a grower of cotton or not for the purpose of this Act, the decision of the Deputy Commissioner of the district in which the person permanently resides shall be final ;
- " Prescribed " (iv) " prescribed " means prescribed by rules or bye-laws made under this Act.
4. (1) The Local Government may, after consulting the district councils, local boards, municipalities, sanitation panchayats, notified area committees and village panchayats in the areas affected or, upon a representation made by them (or by growers of cotton within such areas), by notification, declare that any place is a cotton market established under this Act.
- (2) Every such notification shall define the limits of the cotton market so established and may for the purposes of this Act include within such limits such local area as the Local Government may prescribe.
5. For every market there shall be a market committee. The market committee shall be constituted as prescribed and shall consist of not less than ten and not more than sixteen members. Of these, not less than half shall be persons elected by cotton growers of such area as the Local Government may prescribe. One shall be elected by the district council or the local board of the district in which the market is situated in the manner prescribed, one by the municipality, notified area committee, village sanitation panchayat or village panchayat, whichever may be the local body within whose area of authority the market is situated, and the remainder shall be elected by the traders in the cotton market in such manner as may be prescribed.
6. (1) The Local Government may, either generally or specifically for any cotton market or group of cotton markets, make rules consistent with this Act for the purpose of the management and regulation of such cotton markets under this Act.
- Power to make rules.

(2) In particular and without prejudice to the generality of the foregoing power such rules may provide for or regulate :—

- (i) the election of members of the market committee, the number of members to be elected by each of the bodies or groups of individuals referred to in section 5, and the manner of election, the preparation and revision of lists of voters from time to time, and the term of office of such members ;
- (ii) the qualifications and disqualifications of voters and the candidates for election ;
- (iii) the powers to be exercised and the duties to be performed by the market committee ;
- (iv) the election of the chairman and vice-chairman of such committee, their powers and term of office ;
- (v) the filling of casual vacancies in the office of members or in the office of chairman or vice-chairman of the market committee ;
- (vi) the management of the cotton market and the prescribing of fees by the market committee, and, subject to the provisions of this Act, the collection and disposal of such fees ;
- (vii) the issue by the market committee of licences to brokers, weighmen, measurers, surveyors and warehousemen and other persons using the cotton market and fixing the fees leviable by them, the form in which and the conditions under which such licences shall be issued, and the fees to be charged for such licences ;
- (viii) the place or places at which cotton shall be weighed or measured, and the kind and the description of the scales, weights and measures to be used at such place or places ;
- (ix) the periodical inspection, verification, correction, regulation and confiscation of scales, weights and measures in use in the cotton market ;
- (x) the trade allowances which may be made or received by any person in any transaction in a cotton market ;
- (xi) the preparation of plans and estimates for works proposed to be constructed partly or wholly at the expense of the market committee, and the grant of sanction to such plans and estimates ;
- (xii) the form in which the accounts of the market committee shall be kept, the manner in which they shall be audited and the time or times at which they shall be published ;
- (xiii) the preparation of an annual budget and its submission for sanction, and the reports and returns which shall be furnished, by the market committee ;
- (xiv) the disposal of any surplus or part of surplus funds of the market committee ;
- (xv) the time, place and manner in which a contract between buyer and seller is to be entered into and the money is to be paid to the seller ; and
- (xvi) generally, for the guidance of the market committee and for carrying out the purposes of the Act.

(3) Any such rule may, when necessary, provide that any contravention thereof or of any of the conditions of any licence issued thereunder shall be punishable, on conviction by a competent magistrate, with a fine which may extend to five hundred rupees.

(4) All rules made under this section shall be subject to the condition of previous publication. A copy of the draft of the proposed rules shall be laid on the table of the Central Provinces Legislative Council. The Local Government shall give the Council an opportunity of discussing them, and shall take into consideration any resolution concerning the same which may be passed by the Legislative Council before finally publishing them in the *Central Provinces Gazette*.

7. (1) Subject to the rules made by the Local Government under the last preceding section, the market committee may, in respect of the cotton market under its management, make bye-laws for :—

Bye-laws.

- (i) the regulation of the business,
- (ii) the conditions of trading,
- (iii) appointment and punishment of its officers and servants,
- (iv) payment of salaries, pensions, gratuities, and leave allowances to such officers and servants, and contributions by them to any provident fund which may be established for the benefit of such officers and servants, and
- (v) the delegation of powers, duties and functions of the sub-committee, if any, appointed under section 8;

and may provide that contravention thereof shall be punishable by a competent magistrate with a fine which may extend to fifty rupees.

(2) All bye-laws made under sub-section (1) shall be subject to the condition of previous publication and no bye-law shall take effect until it has been confirmed by the Local Government.

8. The market committee may appoint from amongst its members a sub-committee for the performance of any of its duties or functions.

9. (1) Every contract entered into by the market committee shall be in writing and shall be signed on behalf of the market committee by the chairman and two other members of the market committee.

(2) No contract other than a contract executed as provided in sub-section (1) shall be binding on a market committee.

10. All moneys received by a market committee shall be paid into a fund to be called "The Cotton Market Fund," and all expenditure incurred by the market committee under or for the purposes of this Act shall be defrayed out of the said fund; any surplus remaining after such expenditure has been met shall be expended as may be prescribed in the rules made in this behalf.

Cotton market fund.
Purposes for which fees collected by market committee may be expended.

11. Subject to the provision of section 10, all fees collected by the market committee under this Act or the rules made thereunder shall be expended only on :—

- (1) the maintenance and improvement of the cotton market;
- (2) the construction and repair of buildings which are necessary for the purposes of such market or for the health, convenience and safety of the persons using it;
- (3) the planting of trees, rearing them, making arrangements for providing water to the persons and cattle coming to the market, and like purposes;

- (4) the meeting of establishment charges, including payments and contributions towards provident fund, pension and gratuities of the officers and servants employed by the market committee ;
- (5) the preparation and revision of voters' lists, and the elections and by-elections of the cotton market committee ;
- (6) with the previous sanction of the Local Government, any other purpose whereon the expenditure of the cotton market fund is in the public interest ; and
- (7) the expenses incurred in auditing the accounts of the committee.

12. (1) No trade allowance, other than an allowance prescribed by rules or bye-laws made under this Act, shall be made or received by any person in any transaction in a cotton market established under this Act, and no civil court shall, in any suit or proceeding arising out of any transaction in any such cotton market, have regard to any trade allowance not so prescribed.

No trade allowance permissible unless recognized by rules or bye-laws.

(2) Any purchaser who makes deductions on account of *dharmadaya*, *gorakshan*, or similar other objects shall be liable on conviction to a fine which may extend to fifty rupees for each offence.

13. Every market committee shall be a body corporate and shall have perpetual succession and a common seal and may sue and be sued in its corporate name, and shall be competent to acquire and hold property, both moveable and immovable, to lease, sell or otherwise transfer any such property which may have become vested in or been acquired by it, and to contract and to do all other things necessary for the purposes of this Act :

Market committee to be a body corporate.

Provided that no committee shall permanently transfer any immovable property except in pursuance of a resolution passed at a meeting by a majority of not less than two-thirds of the members of the committee.

14. (1) No suit shall be instituted against any market committee or any member, officer or servant thereof or any person acting under the direction of any such committee, member, officer or servant for anything done or purporting to be done under this Act, until the expiration of two months next after notice in writing, stating the cause of action, the name and place of abode of the intending plaintiff and the relief which he claims, has been, in the case of a committee, delivered or left at its office, and in the case of any such member, officer, servant or person as aforesaid, delivered to him or left at his office or usual place of abode, and the plaint shall contain a statement that such notice has been so delivered or left.

Bar of suit in absence of notice.

(2) Every such suit shall be dismissed unless it is instituted within six months from the date of the accrual of the alleged cause of action.

(3) Nothing in this section shall be deemed to apply to any suit instituted under section 54 of the Specific Relief Act, 1877.

15. (1) Every market committee may, with the previous sanction of the Local Government, raise the money required for carrying out the purposes of this Act on the security of any property vested in and belonging to such committee, and of any fees leviable by such committee under this Act.

Power to borrow.

(2) The conditions in which such money shall be raised and the time within which the same shall be repayable shall be subject to the previous sanction of the Local Government.

16. (1) If, in the opinion of the Local Government, a market committee is not competent to perform, or persistently makes default in the performance of, the duties imposed on it by or under this Act, or exceeds or abuses its powers, the Local Government may, after giving such committee an opportunity for explanation, by an order published in the *Central Provinces Gazette*, declare such committee to be incompetent, or in default, or to have exceeded or abused its powers, as the case may be, and may supersede it.

(2) When a market committee has been superseded, all members of the committee shall, as from the date of the order, vacate their offices as members.

(3) When a market committee has been superseded, all property and rights vested in it shall, subject to all charges and liabilities affecting the same, vest in Government.

Provided that, if no new committee is constituted for the cotton market under section 5, all property that shall remain after the satisfaction of all debts and liabilities of the superseded market committee shall vest in the local authority of the area in which the cotton market is situated for the purpose of any object of public utility in the said area.

17. Whenever the Local Government has, by a notification under section 4, declared any place to be a cotton market, no person shall, notwithstanding anything contained in any enactment for the time being in force, within the area of such cotton market or within a distance thereof, be notified in the *Central Provinces Gazette* in this behalf in each case by the Local Government, set up, establish or continue or allow to be continued any other market for the purpose of the purchase and sale of cotton.

Explanation.—A person shall not be deemed to set up, establish or continue or allow to be continued a place as a market for the purpose of the purchase and sale of cotton if he sells his own cotton outside the premises set apart by the market committee for the purpose of purchase and sale of cotton.

18. Whoever, in contravention of this Act, sets up, establishes, continues or allows to be continued any market for the purpose of the purchase and sale of cotton shall be punished, on conviction by a competent magistrate, with fine, which may extend to five hundred rupees, and in case of a continuing breach of the provision of section 17, with fine which may extend to one hundred rupees for each day after the first during which the breach continues.

19. No offence under this Act or under any rule or bye-law made thereunder shall be triable by a magistrate other than a magistrate of the first class.

20. All fines and damages recovered from an offender shall be paid to the market committee. Prosecutions under this Act may be instituted by any person duly authorized in writing by the market committee in this behalf.

APPENDIX VIII.

MADRAS COTTON CONTROL ACT, 1932.

A Bill to provide for the prohibition of the cultivation of pulichai cotton and the mixing of such cotton with other cotton and for the prohibition or restriction of the possession or use of, or the trade in, pulichai cotton or cotton mixed with pulichai cotton.

WHEREAS it is expedient in the best interests of the growers of cotton in certain areas in the Presidency of Madras, the cotton trade and the economic prosperity of the said Presidency, to maintain the quality and reputation of the cotton grown in those areas and for that purpose to prohibit the cultivation of pulichai cotton and the mixing of such cotton with other cotton and to prohibit or restrict the possession or use of, or the trade in, pulichai cotton or cotton mixed with pulichai cotton.

AND WHEREAS the previous sanction of the Governor-General has been obtained to the passing of this Act :

It is hereby enacted as follows :—

Short title and extent. 1. (1) This Act may be called the Madras Cotton Control Act, 1932.

(2) It extends to the whole of the Presidency of Madras.

Definitions. 2. In this Act, unless there is anything repugnant in the subject or context :—

- (a) " cotton " means cotton plant, ginned and unginned cotton, cotton waste and cotton seed ;
- (b) " notified area " means an area specified in a notification under section 3 ; and
- (c) " pulichai cotton " means the kind of cotton known as *G. neglectum* var. *roseum*.

Power of Local Government to issue notification prohibiting the cultivation, etc., of pulichai cotton. 3. The Local Government may, by notification in the *F. S. Gazette*, in such local area and for such period as may be specified in the notification :—

- (a) prohibit the cultivation of pulichai cotton ; or
- (b) prohibit the mixing of pulichai cotton with any other kind of cotton ; or
- (c) prohibit or restrict the possession or use of, or the trade in, pulichai cotton or cotton mixed with pulichai cotton.

Penalties. 4. Whoever, in contravention of any notification under section 3 :—

- (a) cultivates pulichai cotton, or
- (b) mixes pulichai cotton with any other kind of cotton, or
- (c) possesses, uses or trades in pulichai cotton or any cotton mixed with pulichai cotton shall be punishable with fine which may extend to twenty rupees, and upon any subsequent conviction with fine which may extend to fifty rupees.

Power of entry
and seizure

5. (1) Any officer authorized in this behalf by the Local Government may between the hours of 6 a.m. and 6 p.m. :—

- (a) enter upon any land in a notified area in which he knows or suspects that pulichai cotton is being cultivated in contravention of a notification under section 3, uproot or cause to be uprooted such cotton, and seize the cotton so uprooted ; and
 - (b) enter upon or into any land, building, vessel or place in a notified area in which he knows or suspects that pulichai cotton or any cotton mixed with pulichai cotton is kept in contravention of a notification under section 3, and seize such cotton.
- (2) Every officer seizing any cotton under this section shall forthwith :—
- (a) make a report of such seizure to the Magistrate having jurisdiction to try the offence committed in respect of such cotton, together with particulars of such cotton and furnish a copy of such particulars to the occupier of the land, building, vessel or place on or in which such seizure was made, and
 - (b) subject to such rules as the Local Government may prescribe forward such cotton to the nearest officer authorized by the Local Government to receive it, for examination and report to the Director of Agriculture, Madras.

(3) The opinion of the authorized officer referred to in clause (b) of sub-section (2), contained in any document signed by such officer regarding the cotton sent to him for examination under that clause, may be used as evidence as to the nature of such cotton, in any inquiry, trial or proceeding under this Act.

Duty of owner and occupier to give facilities for inspection by authorized officer.

6. (1) Every owner or occupier of any land, building, vessel or place shall give all reasonable facilities to any officer authorized under sub-section (1) of section 5 to inspect such land, building, vessel or place.

(2) Whoever commits a breach of the provisions of sub-section (1) shall be punishable with fine which may extend to twenty rupees.

Previous sanction and limitation for prosecution.

7. No prosecution for an offence made punishable by this Act or any rule made thereunder shall be instituted :—

- (i) without the previous sanction of the Director of Agriculture, Madras, or
- (ii) after six months from the date of the commission of the offence.

8. No offence made punishable by this Act or any rule made thereunder shall be inquired into or tried by any Court inferior to that of a Presidency Magistrate or a Magistrate of the second class.

9. No suit, prosecution or other legal proceeding whatever shall be entertained in any Court against any person for anything in good faith done or intended to be done in pursuance or execution of this Act.

10. (1) The Local Government may, by notification in the *Fort St. George Gazette*, make rules consistent with this Act to carry into effect the purposes thereof.

Power of Local Government to make rules.

(2) In making any rule, the Local Government may provide that a breach thereof shall be punishable with fine which may extend to twenty rupees.

NOTIFICATIONS AND RULES UNDER THE MADRAS COTTON CONTROL ACT.

GOVERNMENT OF MADRAS, DEVELOPMENT DEPARTMENT.

G. O. No. 939, 12th July 1932.

NOTIFICATIONS.

I

In exercise of the powers conferred by section 3 of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932), the Governor acting with Ministers is hereby pleased to prohibit in the districts of Madura, Tamnad, Tinnevely and Coimbatore, for a period of three years :—

- (a) the cultivation of pulichai cotton ;
- (b) the mixing of pulichai cotton with any other kind of cotton ; and
- (c) the possession or use of, or the trade in, pulichai cotton or cotton mixed with pulichai cotton.

II

In exercise of the powers conferred by sub-section (1) of section 5 of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932), the Governor acting with Ministers is hereby pleased to authorize all Deputy Directors of Agriculture and District Agricultural Officers, having jurisdiction over any notified area to exercise the powers specified in that section, within such area.

III

In exercise of the powers conferred by clause (b) of sub-section (2) of section 5 of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932), the Governor acting with Ministers is hereby pleased to authorize the Cotton Specialist, Coimbatore, to receive cotton seized under sub-section (1) of that section for examination and report to the Director of Agriculture, Madras.

IV

Rules under section 10 (1) of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932).

In exercise of the powers conferred by sub-section (1) of section 10 of the Madras Cotton Control Act, 1932 (Madras Act VII of 1932), the Governor acting with Ministers is hereby pleased to make the following rules to carry into effect the purposes of the said Act :—

1. The report required to be made under clause (a) of sub-section (2) of section 5 of the Act shall be in Form A or Form B annexed to these rules, according as the cotton to which the report relates was seized under clause (a) or (b) of sub-section (1) of section 5.

2. Every officer seizing any cotton under sub-section (1) of section 5 shall forward to the officer referred to in clause (b) of sub-section (2) of that section :—

- (a) if the cotton seized weighs more than ten lbs. a sample of such cotton weighing ten lbs. and
- (b) if the cotton seized weighs less than ten lbs. all the cotton seized.

FORM A.

Report of the seizure of cotton under clause (a) of sub-section (1) of section 5 of the Act.

1. Description of the land in which the pulichai cotton was cultivated :—
 - (a) District.
 - (b) Taluk.
 - (c) Village.
 - (d) (i) Survey number and
(ii) Sub-division number, if any.
2. Name of the owner or occupier of the land.
3. Particulars of the cotton seized :—
 - (a) Description.
 - (b) Quantity.
4. Any other remarks.

Station.

Signature of the Reporting Officer.

Date.

FORM B.

Report of the seizure of cotton under clause (b) of sub-section (1) of section 5 of the Act.

1. Description of the land, building, vessel or place in which the pulichai cotton or cotton mixed with pulichai cotton was kept :—
 - (a) District.
 - (b) Taluk.
 - (c) Village.
 - (d) (i) Survey number and
(ii) Sub-division number, if any.
2. Name of the owner or occupier of the land, building, vessel or place.
3. Name of the person from whose possession the cotton was seized.
4. Particulars of the cotton seized :—
 - (a) Description.
 - (b) Quantity.
5. Any other remarks.

Station.

Signature of the Reporting Officer.

Date.

APPENDIX IX.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—(1) *The Broach Tract*.—The policy of growing 1027 A.L.F. in the Surat-Broach Tract lying south of the river Narmada was continued, and 734,465 lbs. of seed were distributed to cultivators by opening 20 depots financed from the subsidy granted by the Indian Central Cotton Committee, Bombay, for the purpose. Besides, 1,572,060 lbs. improved 1027 A.L.F. seed was supplied to Rajpipla, Chhota-Udepur, Jambughoda and other States and the areas in these territories may safely be said to have been rehabilitated.

(2) *The Kumpta-Dharwar Tract*.—The work of introducing two improved varieties of cotton, viz., *Jayawant* (Dharwar No. 1 x Dharwar No. 2) and *Upland* (Gadag No. 1) was carried out on an extensive scale through the Cotton Sale Societies, Hubli and Gadag, with the aid of funds subsidised by the Indian Central Cotton Committee as outlined in the previous report. For multiplying pure pedigree seed of these two varieties, blocks of reserved areas were organised as usual. The reserved area under *Jayawant* cotton in Hubli centre was 17,640 acres and that under *Gadag* No. 1 in Gadag centre 22,514 acres against 17,057 acres and 23,638 acres respectively last year. The cotton crop was below normal owing to adverse climatic conditions. The quantities of seed cotton received by the Hubli and Gadag Sale Societies from these reserved areas were 5,565 *dokras* (1,869,840 lbs.) of *Jayawant* and 5,178 *dokras* (1,739,808 lbs.) of *Gadag* No. 1 and seeds produced therefrom were 1,060,000 lbs. and 1,200,000 lbs. to cover 106,000 acres and 120,000 acres respectively during the coming season.

With a view to spread *Jayawant* cotton all over the Dharwar-Kumpta area, separate seed multiplication blocks of 4,532 acres at Haveri, 1,851 acres at Bailhongal and 1,604 acres at Athani were organised and the seed obtained has been kept for general distribution. A separate seed multiplication scheme for Athani centre has been sanctioned by the Indian Central Cotton Committee during the year and seed sufficient for a reserved area of 1,100 acres has been purchased. An area of 20 acres was taken on lease and added to Dharwar Farm for multiplication of selfed seed in the second generation.

The quantity of *Jayawant* cotton continued to be good whereas that of *Upland* cotton was affected to a certain extent due to unfavourable weather conditions during the year.

Jayawant continued to be appreciated by the buyers; but *Gadag* No. 1 cotton produced inferior staple owing to adverse climatic conditions and was less appreciated by the buyers. The buyers gave on an average Rs. 7 more per *Naga* of seed cotton (1,344 lbs.) for *Jayawant* and Rs. 15 per *Naga* more for *Gadag* No. 1 in auction sales held at Hubli and Gadag respectively over the local cotton against Rs. 13 and Rs. 25 per *Naga* of last year.

(3) *The Khandesh Tract*.—*Banilla* cotton continued to be popular in Khandesh. The total area under *Banilla* during 1931-32 is estimated at 125,000 acres grown from seed distributed by the Agricultural Department or preserved by the cultivators or sold by local gin-owners and other seed dealers. The total outturn was only about 10,000 bales giving an average yield of 32 lbs. of lint per acre. The ginning percentage was maintained and was 38 to 40 per cent. But the quality of cotton was rather damaged having yellow stain, and admixture of leaf and weak staple. *Banilla* cotton grown from seed distributed by the Department fetched on an average a premium of Rs. 20 per *candy* over local cotton and Rs. 25 per *candy* over *Oomra*.

With a view to supply genuine seed of *Banilla* to cultivators a five-year scheme has now been launched with the funds provided by the Indian Central Cotton Committee. During 1931-32 the "Reserved Area" was 2,780 acres. Owing to unfavourable season only 136,500 lbs. of seed were obtained from this area.

MADRAS.—I. *The Southern Tract*.—(a) *Cambodia—Coimbatore—General*.—The multiplication of the improved varieties of *Cambodia* cotton began in 1918-19. There are six limited liability co-operative seed societies of cotton growers at present,

against 15 in the previous year. Of these three in the Avanashi taluk, with an area of 871 acres, are under the control of the Co-operative Department against eight with an area of 850 acres in the previous year. The rest are under the supervision of the Agricultural Department. Under annual contracts, the Agricultural Department has been supplying improved seed to cultivators and advancing Rs. 5 to Rs. 7 per acre towards cultivation expenses. The cultivators sow the seed supplied by the Department on "Seed Farms" and the operation is supervised by the Department. The lint from the seed farm *kapas* is sold by the Department in public auction on behalf of the *ryots* at a premium and the seed is bought by the Department at a premium of Rs. 2 per *polhi* of 260 lbs. The seed is put up in bags of 25, 50 and 100 lbs. which are sealed with a lead seal inscribed ^M A D as a precaution against mixing of departmental seed with *bazar* grades.

The seed is distributed among cultivators for extending the improved varieties. With the increased expansion of the seed farms, it is hoped that greater quantity of good seed will be made available for cultivators and that eventually high quality of lint will become a common feature of the country.

(i) The number of seed societies for Co. 2 cotton under the control of the Agricultural Department at the Tiruppur centre was three with an area of 727 acres against seven with an area of 718 acres in 1930-31. The Department also organised seed farms for 275 acres in the Annur area in the Avanashi taluk against 240 acres in the previous year. Thus, the total area under seed farms was 1,002 acres against 958 acres in the previous year.

292,250 lbs. of improved seed sufficient for sowing 14,600 acres were distributed in 1931-32 among the growers of cotton in the district of Coimbatore for further production against 212,701 lbs. in the previous year.

28,290 lbs. of seed were transferred to other districts in the Presidency and 2,225 lbs. were transferred outside the Presidency.

(ii) 345 *candies* of *Cambodia* lint were sold in a declining market on behalf of the seed farm *ryots* at a premium of Rs. 10 per *candy* of 500 lbs. against Rs. 20 to Rs. 30 in the previous year.

(iii) The Tiruppur Loan and Sale Society distributed 76,000 lbs. of seed sufficient for sowing 3,800 acres.

(iv) *Co-operative ginning*.—A few *ryots* in the taluks of Pollachi and Gobichettipalayam ginned their *kapas* with departmental assistance and sold 79,150 lbs. of good seed for sowing about 4,000 acres in the district against 164,000 lbs. in the previous year.

Cambodia—Trichinopoly.—In the Trichinopoly district also, *ryots* used 7,050 lbs. of Co. 2 *Cambodia* seed against 6,092 lbs. in the previous year.

Cambodia—Madura.—The area under seed farms (Co. 2) was 137 acres against 115 acres in the previous year.

(b) *Karunganni—Coimbatore*.—*Karunganni* cotton is making headway in the dry lands of the district of Coimbatore and is displacing dry *Cambodia* and *Uppam*. This strain is being propagated also in seed farm areas under contract with selected *ryots* as in the case of *Cambodia*. 122,577 lbs. of *Karunganni* seed mostly purchased from the seed farms of 1930-31 were distributed among cultivators for sowing in the district of Coimbatore against 99,875 lbs. in the previous year. The area under the improved strains will be about 8,200 acres against 5,000 acres in the previous year.

The area under seed farms in 1931-32 amounted to 791 acres against 750 acres in the previous year.

Karunganni—South.—The multiplication of the seed C-7 and A-10 on seed farms and production and sale of lint to agencies like Seed Unions and Co-operative Societies were

continued without the intervention of the Agricultural Department. The area under seed farms fell from 955 acres to 707 acres (350 acres under *A-10* and 357 acres under *C-7*) in the year under review. The fall in area is due to the fact that *Karunganni* cotton has not found favour with the *ryots* owing to a succession of bad seasons and consequential low yields. An advance of Rs. 5 per acre was given as usual to the seed farm *ryots* for cultivation expenses.

63,833 lbs. of seed obtained from the seed farms of 1930-31 were sold to *ryots* for sowing about 6,380 acres against 115,195 lbs. in the previous year. Departmental strains in varying degrees of purity are now universal throughout the south and pure *Uppam* seeds formerly sown in the Ramnad District are used only in mixtures with *Karunganni*.

II. *Northerns and Westerns Tract.*—(A) *Northerns.*—*N-14* is the improved strain for the locality though it is not suited to the stiff black soils in the tract, especially when the rainfall is anything less than 30 inches. It was grown on 1,805 acres in the taluks of Nandyal and Koilkuntla under seed farm conditions against 1,728 acres in the previous year.

88,550 lbs. of *N-14* seed, mostly obtained from the seed farms of 1930-31, were distributed for sowing against 91,916 lbs. in the previous year. The total area cultivated from seed distributed by the Department and *ryots* was 27,815 acres, i.e., 1,674 acres less than the area brought under cultivation in the previous year. The estimated yield of *kapas* was 150 lbs. per acre against 98 lbs. in the previous year. The Department assisted the seed farm *ryots* and other cultivators who grew the strain in ginning their *kapas* and selling the lint jointly. 145 bales of 500 lbs. each of lint were sold at a premium of Rs. 35 to Rs. 40 per bale against Rs. 59 in the previous year.

(B) *Westerns.*—*H-1* strain evolved at the Hagari Agricultural Research Station in the Bellary District is spreading not only in the Westerns tract but also in parts of the taluks of Jammalmadugu and Proddatur in the Northerns tract. 240,104 lbs. of seed mostly obtained from the seed farms of 1930-31 were distributed for sowing in seed farms and *ryots*' fields. The area so sown was 24,861 acres against 22,500 acres in the previous year.

A large area of seed farms was being maintained in previous years, but the whole of the produce from the seed farm area was not purchased by the Department. Seed sufficient to cover the money advanced to the *ryots* for cultivation expenses was purchased for distribution in the following sowing season. But in the year under report, it was decided to purchase the whole of the produce from the seed farm area and to reduce the area suitably. The area under seed farms round about Guntakal in 1931-32 was thus only 2,748 acres against 6,407 acres in the previous year. The estimated yield of *kapas* was only 90 lbs. per acre against 100 to 120 lbs. in the previous year. The low yield was due to adverse season.

The Department assisted the *ryots* in ginning their *kapas* and selling the lint jointly. 234 bales of 400 lbs. each of lint were sold at a premium of Rs. 10 to Rs. 15 per bale against Rs. 14 to Rs. 25 in the previous year.

UNITED PROVINCES.—A. 19.—In the year under report the distribution of A. 19 cotton seed from Government stores was discontinued, as it was considered that this type was well established in and around Aligarh. The present policy is to encourage C. 520 in this tract but a good deal of demonstration is necessary before it can displace A. 19. So far it has been found suitable only to areas in which irrigation facilities are available. C. 402 was grown on a small scale; its extended growth, however, in this tract is a doubtful proposition. Canal water, an essential at the end of May and early June, if this cotton is to thrive, is somewhat uncertain. The year was not a good one for cotton and C. 402 suffered as much as others. The following amounts of *kapas* were dealt with through the Department:—

Western circle	198 maunds.
Central circle	1,995 "
Sarda area	2,177 "

The position of the two strains *C. 402* and *C. 520* evolved by the Botanical Section stands as follows:—

C. 402.—This is a strain which furnishes a quality of lint fit for spinning 16-20 counts and has been tested for its spinning capacity both by the Director, Technological Laboratory, Bombay, and the local mills at Cawnpore. *C. 402* gives a high ginning percentage of 38 and this character makes it a valuable cotton for ginner and traders as well. As all long-staple cottons tend to be rather late in their maturation period, *C. 402* requires to be sown early by means of artificial irrigation. Therefore it can only be taken up in canal irrigated tracts of the United Provinces. With the opening of the Sarda Canal a new tract comprising Unao, Hardoi and portions of Lucknow and Sitapur districts, where cotton can be grown, is being tried for its introduction. The cultivators have no experience of cotton cultivation with irrigation in these parts and attempts are being made by the Deputy Directors of Agriculture to explain the methods and advantages of cotton sowings with canal irrigation. In 1931-32 the Department of Agriculture distributed seed for about 1,490 acres. The Co-operative Department organised a Cotton Purchase and Sale Society which invested Rs. 14,445 for purchasing unginned cotton from the cotton growers, and after paying all charges for collection, cleaning, ginning and baling the Society gained a net profit of more than Rs. 5,000, the premium received being Rs. 1-9-0 per maund over *Bengals*.

C. 520.—This cotton was isolated as a result of a short survey of the botanical types conducted in the upper portions of the Gangetic Plain in Saharanpur and Bijnor districts in 1919 and 1920.

This is an early flowering, medium-stapled, high-ginning and high-yielding cotton which the average grower in the main cotton tract would like to take up without any consideration of staple and quality. This strain was not pushed forward in the irrigated areas as it was first evolved with a view to meet the demands of an improved strain in tracts, where facilities of irrigation do not exist and the cotton area is sown on the break of the monsoon only. But no arrangement for regular trials in rain-fed areas with this cotton has yet been possible.

THE PUNJAB.—The total area under *American* was reported in the final cotton forecast to be 762,600 acres as compared with 836,100 acres in the preceding year. Of this 4-*F* was grown on 674,861 acres.

285-*F*—a later selection—was reported to have been grown on 85 acres, whilst 289-*F*—the other later selection—was reported to have been grown on 28,099 acres.

In the Final Cotton Forecast an area of 1,397,700 acres was reported under *desi* cottons against 1,329,200 acres during the preceding year. *Mollisoni*—a selection of the *Indicum* variety—was grown on 539,989 acres whilst a type of improved *Roseum* was grown on 71,707 acres.

At Lyallpur work continued on the selection of types of both *American* and *desi* cottons with a view to produce improved strains.

CENTRAL PROVINCES AND BERAR.—The area under *Verum* increased considerably during the year 1931-32 when 6,549 *khandies* of *Verum* seed were distributed throughout the province, which was sufficient to sow an area of approximately 261,600 acres. The season, however, was very bad for cottons in general, by reason of an abnormal and protracted rainfall which extended practically up to the middle of November, and a fine, promising crop was reduced to a wretched one, giving a very poor outturn. The premium obtained for the lint of *Verum*, however, was very satisfactory. Owing to the pool organisation in the province, the average price obtained by the cultivators for *Verum* lint was 36 per cent. above *Oomras* and 12 per cent. above *Broach* in 1931, while in 1932 (between 25th November 1931 and 21st March 1932) *Verum* fetched Rs. 269-2-0 per *candy* of 784 lbs. (2 bales) F.O.R. Bombay, i.e., 31 per cent. above *Oomras* and 28.5 per cent. above *Broach* which was then selling at Rs. 209-6-0 (average). This price, however, was obtained in the local markets and it is interesting to note that, with the exception of a very small quantity,

exported by traders outside the province, practically the whole crop of *Verum* 262, in the Central Provinces and Berar, was absorbed by the local mills. There has grown a very considerable demand for the seed of this cotton in these provinces, particularly in tracts which are infested with *wild*, and attempts are being made to obtain a larger supply of pure seed for distribution in the next season. The variety is however somewhat susceptible to unfavourable climatic conditions.

BURMA.—Myingyan Circle.—The improved *Pwinbyu* strain of white flowered cotton was multiplied on 4,500 acres. Owing to the failure of the early rains the crop did badly and in some centres failed altogether.

The re-selected *C. 19* strain which was multiplied on the Central Farm at Mahlaing, and on 687 acres cultivated by private growers, gave a ginning outturn of 42 per cent., which represents an improvement of 30 per cent. in the outturn of ginned cotton.

West Central Circle.—In the West Central Circle this crop is of importance only in Thayetmyo District where it is grown as a mixed crop with sesamum or with *taungya-ya* paddy. Its area there is just short of half a lakh acres.

Experimental work on cotton was continued on the Allannmyo Farm. Of the several crosses and pure lines kept under observation the Wagyi-Broach crosses, and four pure strains each of *Wagale* and *Wagyi* have been retained for further trials in 1932-33.

HYDERABAD STATE.—The Breeding work for the improvement of *Gaorani* cotton was continued on the Government Farm, Parbhani. Also a Botanical Survey of the cottons grown in the State is in progress.

Gaorani Tract.—The distribution of *Gaorani* seed was continued on more or less the same lines as in the previous seasons. About 1,680,000 lbs. of the best *Umri* seeds were purchased by the Department of Agriculture and given on *Takavi* loan system to the cultivators in the Protected Area. The area sown with the Departmental seed was about 1 lakh acres.

Aurangabad District.—The work of distributing *Banilla* cotton seed was continued to replace the mixture now grown in this district; 72,000 lbs. of *Banilla* seed were purchased from the Bombay Agricultural Department and were distributed in the villages of Jalna Taluka of Aurangabad District.

Raichur and Kopbal Districts.—**Kumta and Dharwar.**—*American* of this area are hopelessly mixed. The work of replacing them with improved types was continued. About 200,000 lbs. of *Jayawant* and 50,000 lbs. of *Gadag No. 1* seeds were purchased from the Hubli and Gadag Cotton Sale Societies respectively and were distributed on the *Takavi* system to the cotton growers in this area. In the case of *Jayawant* cotton, the reports received so far are encouraging and there is now a keen demand for the seed of *Jayawant*.

RAJPIPLA STATE.—The Rajpipla State has continued its policy of maintaining the improved strain (1027 *A.L.F.*) as a pure crop throughout the State. No other variety is grown and the purity is maintained (1) by the annual distribution of selected seed obtained by special arrangement with the Bombay Department of Agriculture, (2) by the Cotton Transport Act which prohibits and penalises the sowing or importing into the State for purposes of sowing of *Goghari* cotton seed or any other short-staple seed, and (3) by the control of ginning and pressing factories. The best seed of 1027 *A.L.F.* was, as usual, secured by deputing the experienced Thandar of Jhagadia with some leading cultivators of the State who purchased it with the assistance and guidance of the Cotton Superintendent, Surat. The seed thus obtained was distributed to the cultivators of the State from the different depots by way of *Takavi* and the outturn and the quality of cotton was all that could be desired.

Rajpipla cotton is now recognised as equal to the very best type of Surat cotton and is largely sought after.

For the next year too the State has, as usual, arranged to obtain the best seed of the improved strain of 1027 *A.L.F.* variety from Surat.

MYSORE STATE.—The cotton crop during the year was 66,303 acres as against 82,624 acres of the previous year.

The most important crop was *Sannahatti* (*G. herbaceum*) or *Kumpta* grown in large areas in Chitaldrug and Shimoga Districts, covering an area of nearly 61,000 acres. The staple measures about $\frac{7}{8}$ " with a ginning outturn of 25 per cent. Selection 69 occupies more than 20,000 acres in this tract and it gives a ginning outturn of 29 per cent. The lint is very much appreciated in the cotton market at Hubli.

In the South-eastern part of the State in Mysore District about 2,400 acres of *Nadam* (*G. obtusifolium*) cotton is grown in four of the taluks, where cotton soil prevails. By hybridizing *G. arboreum* and *G. herbaceum*, a strain of cotton has been evolved which has a staple of full 1" with a ginning outturn of 29 per cent. This strain is being tested and multiplied on a large scale.

Round about Banavar and adjoining tracts about 3,000 acres of *Dharwar-American* cotton, locally called *Doddahatti* (*G. hirsutum*) is grown. It is said to have a reputation in the Bombay market. The plant is highly susceptible to leaf blight. Improvements by selection within the variety as well as by hybridization with American cottons have yielded some very valuable strains which possess good staple and high percentage of lint. They are being tested in several places during the year both for yield and quality.

APPENDIX X.

BALANCE SHEET AS AT MARCH 31st, 1932.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE AND INVESTMENTS.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts	80,28,627 15 9		I.A. Administration		11,95,707 3 6
INTEREST ACCOUNT—			B. Improvement of Cotton Marketing		73,244 1 1
Amount received on investments	10,50,348 6 7		C. Seed Distribution and Extension Schemes:		
Add—Refund of Income-tax deducted on interest	15,215 9 0		(i) Bombay—		
	10,65,563 15 7		(a) Hubli	13,330 6 0	
Less:—Interest paid in advance at the time of purchasing Government Paper (since recovered) and Bank's commission for collection of interest.	40,382 12 9		(ii) Gadag	21,075 13 9	
Income-tax deducted on interest	17,640 2 6		(iii) Khandesh	23,250 4 0	
Interest credited to Provident Fund Account	4,886 6 2		(iv) Surat	13,377 1 6	
Bank's withdrawal charges for securities sold	1,690 8 0		(v) Madras	3,060 0 0	
Provision for sinking fund	2,675 9 0		(2) Lyalpur Gmery	18,125 0 0	
Profit on conversion of 6% Tax free Bonds into 9% Taxable loan	67,275 6 5		(3) Sind	24,880 2 0	
Sinking Fund Account			(4) Hyderabad	8,065 14 3	
Miscellaneous Receipts			(5) Central Provinces	43,416 2 6	
Refund from Provident Fund account for contributions disallowed to subscribers resigned			D. Printing and Propaganda		1,68,580 12 0
Suspense receipts			II. Technological Research		9,536 0 0
Carried over	90,52,360 13 9		(i) Capital Expenditure		
			(a) Lands and Buildings	3,55,797 9 11	
			(ii) Machinery	83,977 6 1	
			(iii) Freight	7,502 2 8	
			(iv) Apparatus and Equipment	41,558 3 7	
			(v) Machinery Workshop	5,789 8 3	
			(vi) Working Expenses	10,63,658 5 10	
			B. Provincial	27,350 8 9	
			(2) Research Studentships		15,85,633 13 1
			III. AGRICULTURAL RESEARCH GRANTS.		1,94,742 10 9
			Bombay—		
			(a) Surat Physiological	2,25,077 13 9	
			(b) Surat Bollworm	1,14,569 9 7	
			(c) Surat Bollworm Propaganda	29,000 12 0	
			(d) Dharwar Wilt	1,79,931 5 7	
			(e) Khandesh	26,384 6 0	
			(f) Co-ordination of cotton research	314 4 0	
Carried over			Carried over	5,75,218 2 11	32,27,444 8 5

BALANCE SHEET AS AT MARCH 31st, 1932—contd.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE AND INVESTMENTS.	Rs. a. p.	Rs. a. p.
Brought forward ..		90,52,360 13 9	Brought forward ..	5,75,218 2 11	32,27,444 8 5
			V. Madras :—		
			(a) Herbaceum ..	85,516 4 5	
			(b) Pempheres and Physiological ..	15,209 10 10	
			(c) Fodder Cholam ..	3,019 10 0	
			VI. Punjab :—		
			(1) Botanical ..	3,52,494 6 5	
			(2) Entomological ..	95,772 14 1	
			(3) White Fly ..	8,728 10 0	
			VII. Central Provinces ..	2,44,194 12 1	
			VIII. United Provinces ..	1,33,060 9 3	
			IX. Institute of Plant Industry, Indore ..	10,29,676 12 0	
			X. Sind ..	1,09,044 7 1	
			XI. Burma :—		
			(a) Capital ..	2,906 15 5	
			(b) Cotton Improvement ..	4,074 12 0	
			XII. Hyderabad :—		
			(1) Botanical ..	66,625 10 2	
			(2) Cotton Survey ..	3,581 11 0	
			XIII. Bikaner ..	19,881 0 0	
			XIV. Baroda—Root Rot ..	3,212 0 0	
			XV. Loans recoverable (but considered doubtful) ..		27,52,228 3 8
			Suspense account ..		12,805 0 0
			By Balance ..		63 11 2
Grand Total ..		90,52,360 13 9	Grand Total ..		30,59,819 6 6
					90,52,360 13 9

BALANCE SHEET AS AT MARCH 31ST, 1932.

Provident Fund Account.

RECEIPTS.	—,		—		INVESTMENTS.	Face Value.		Cost.
	Rs.	a. p.	Rs.	a. p.		Rs.	a. p.	
Subscribers' Contributions ..	95,990	7 3			3½% G. P. Notes ..	85,600	3 1	59,754
Less—Refunds to Subscribers ..	28,964	7 2			5% 1939-44 Taxable Loan ..	25,600	15 6	24,606
Committee's Contributions ..	98,753	9 0	67,026	0 1	6% 1933-36 Taxable Loan ..	29,900	2 0	30,025
Less—Payments to Subscribers resigned ..	27,103	6 6			4% 1934-37 Taxable Loan ..	2,000	0 0	1,795
Recoveries against Advances ..			66,650	2 6	Balance in Current Account with the Imperial Bank of India, Bombay ..			14,423
Suspense deposit of Mr. Dutt's Contributions ..			15,498	10 0				2 1
Total ..			882	9 7				11 5
			1,50,057	6 2				
DEDUCTIONS.								
(1) Advances made ..	17,734	7 0						
(2) Accrued Interest credited to Subscribers on 31st March 1932 ..	1,718	8 6	19,452	15 6				
Grand Total ..			1,30,604	6 8	Grand Total ..	....		1,30,604

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31st, 1932.

STATEMENT SHOWING EXPENDITURE ON RESEARCH SCHEMES.

Major heads.	Total sanctioned grant.	Period. Yrs. Mths.	Date of starting of work.	Total Expenditure up to 31st March 1932.	Expenditure from Capital Grant on			Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	REMARKS.
					(a) Lands and buildings	(b) Machine and apparatus other than movable property.	(c) ()			
	Rs. a. p.	3	4	5	6	7	8	9	10	
RESEARCH SCHEMES.										
II. <i>Technological Research.</i>										
(1) <i>Technological Laboratory.</i>										
(a) Capital Expenditure	5,04,799 8 8		1923.	4,94,624 14 6	3,55,797 9 11	1,38,827 4 7		28,669 12 10	10,34,588 9 0	
(b) Working Expenses	19,63,658 5 10		{ Jan. 1924.	17,45,009 9 7	.....	.....		1,409 0 3	25,941 8 6	
(c) Total	27,350 8 9		{ April 1928.	27,350 8 9	.....	.....		
IV. <i>Agro-chemical Research Grants:</i>										
(1) <i>Bombay Schemes:</i>										
(a) Surat Physiological	2,91,445 0 0	9 11	Sept. 1923	2,25,077 13 9	.....	.....		15,911 15 6	2,09,165 14 3	*Closed down on 31-3-31.
(b) Surat Boll-worm*	1,20,720 0 0	7 7	Sept. 1923.	1,14,509 9 7	.....	.....		4,707 8 7	1,09,802 1 0	
(c) Surat Boll-worm Propaganda and Clean-up.	83,080 0 0	1 10	April 1931.	29,000 12 0	.....	.....		2,627 10 0	28,373 2 0	†Cotton Breeding Scheme closed down in July 1929
(d) Dnyanesh Breeding and Co-ordination of Cotton	2,63,545 0 0	8 9	Sept. 1923.	1,79,931 5 7	.....	.....		13,604 1 7	1,66,327 4 0	
(e) Khandesh Cotton Breeding	27,985 0 0	5 6	Oct. 1926.	26,384 6 0	.....	.....		.....	26,384 6 0	‡Closed down on 31-3-32.
(f) Co-ordination of Cotton Research	23,991 0 0	.....	Not started.	314 4 0	.....	.....		.....	314 4 0	
V. <i>Madras Schemes.</i>										
(1) Herbaceous	1,07,460 0 0	10 6	Dec. 1923.	85,516 4 5	.....	.....		4,398 7 10	81,117 12 7	
(2) Penicillium and Physio-	66,000 0 0	2 4	Sept. 1931.	15,209 10 10	.....	.....		2,288 5 3	12,921 5 7	
(3) Fodder Cholera :-	900 0 0	.....	Jan. 1931	3,019 10 0	.....	881 11 7		.....	.....
(a) Capital	4,716 0 0	3 0	.....	.....	.....	.....		.....	2,137 14 5	||Rs. 2,030 transferred to Capital from Working grant.
(b) Recurring	.....	.....	.....	.....	.....	.....		.....	.....
(c) Botanical :-	191,330 0 0	9 8	Aug. 1925.	3,52,494 6 5	22,158 0 0	9,102 11 0		14,309 14 0	3,06,923 13 5	
(d) Capital Expenditure	15,23,900 0 0	.....	.....	.....	.....	.....		.....	.....
(e) Working Expenses	.....	.....	.....	.....	.....	.....		.....	.....
(f) Botanical :-	6,000 0 0	6 11	May 1926	95,772 14 1	.....	5,826 3 10		6,755 11 0	83,190 15 3	¶The balance of this amounting to Rs. 3,100-13-5 lapsed on revision.
(g) Capital Expenditure	1,22,000 0 0	.....	.....	8,728 10 0	.....	.....		132 4 0	8,596 6 0	
(h) Working Expenses	34,500 0 0	2 6	May 1931.	2,44,194 12 1	.....	.....		4,174 10 11	2,40,020 1 2	
(i) White Fly	461,000 0 0	8 0	Oct. 1926.	.....	.....	.....		.....	.....
(j) Central Provinces	3,23,165 0 0	8 0	April 1926.	.....	.....	.....		.....	.....
VII. <i>United Provinces</i>										
(1) <i>United Provinces Scheme :-</i>										
(a) Boll-worm Expenditure	54,000 0 0	8 0	Jul 1923.	1,33,060 9 3	.....	47,788 10 6		3,065 4 3	82,236 10 6	
(b) Working Expenses	.....	.....	.....	.....	.....	.....		.....	.....
(c) Recurring grant for staff	39,775 0 0	7 0	Oct. 1926.	.....	.....	.....		.....	.....

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31st, 1932—*contd.*

Major heads.	Total sanctioned grant.	Period. Yrs. Mths.	Date of starting of work.	Total Expenditure up to 31st March 1932.	Expenditure from Capital Grant on—		Expenditure from annual apparatus and equipment of a permanent or semi-permanent nature.	Net working capital to staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	REMARKS
					(a) Lands and buildings.	(b) Machinery and apparatus and other moveable property.			
1	2	3	4	5	6	7	8	9	10
AGRICULTURAL RESEARCH GRANTS—									
I. Institute of Plant Industry, Indore.									
(a) Capital Expenditure.	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(b) Working Expenses ..	52,83,836 11 9	Perma- nent. 9	[Oct. 1924.]	10,29,676 12 0	2,12,552 11 5	70,984 0 4	31,857 4 4	7,14,282 11 11	Rs. 50,202-10-10 transferred from Rs. 50,202-10-10 Capital.
X. Seed ..	7,46,140 0 3		July 1927.	1,09,044 7 1	.....	.....	10,187 1 11	98,857 5 2	
IX. Burma ..	2,74,346 0 0			2,906 15 5	.....	2,906 15 5	1,046 0 0	3,028 12 0	
(a) Capital Expenditure.	3,000 0 0	3 ..	April 1931.	4,974 12 0	.....	.....	5,674 11 4	60,950 14 10	
(b) Cotton Improvement ..	19,224 0 0			66,625 10 2	.....	.....	49 1 4	3,542 9 8	
XII. Hyderabad ..	1,22,500 0 0	5 0	May 1929.	5,391 11 0	.....	.....	.....	7,601 5 3	
(a) Capital Expenditure.	33,680 0 0	4 10	June 1931.	19,881 0 0	8,520 10 9	3,739 0 0	.....	3,212 0 0	
(b) Cotton Survey ..	14,500 0 0		Jan. 1931.	3,212 0 0	.....	.....	.....	.....
XIII. Bihar ..	38,200 0 0	5 0	Feb. 1932.	.....	.....	.....	.....	.....
(a) Capital Expenditure.	21,720 0 0	2 0		.....	.....	.....	.....	.....
(b) Working Expenses ..	.....			.....	.....	.....	.....	.....
XIV. Baroda.—Root Rot ..	.....			.....	.....	.....	.....	.....
SEED EXTENSION SCHEMES.									
C. SEED DISTRIBUTION AND EXTENSION SCHEMES.									
1. Bombay ..	40,800 0 0	5 years.	June 1930.	13,330 6 0	.....	.....	.....	13,330 6 0	Not yet started.
(a) Public ..	44,975 0 0	5 years.	June 1930.	13,800 13 9	.....	.....	.....	13,800 13 9	Started in April 1932.
(b) Gadag ..	27,782 0 0	5 years.	June 1931.	7,275 0 0	.....	.....	2,957 4 3	4,317 41 9	
(c) Gadag Supplementary ..	27,782 0 0	5 years.	.....	.....	.....	.....	.....	.....
(d) Haveri ..	46,757 0 0	5 years.	.....	.....	.....	.....	.....	.....
(e) Alhami ..	27,425 0 0	5 years.	.....	.....	.....	.....	.....	.....
(f) Badkhal ..	29,660 0 0	4 years.	April 1930.	13,377 0 0	.....	.....	.....	13,377 0 0	Not yet started.
(g) Surat ..	27,740 0 0	5 years.	Sept. 1931.	23,250 4 0	.....	.....	3,126 13 0	20,123 7 0	* Recoveries to amounting Rs. 1,10,000 are anticipated from this scheme which was started from Rs. 2,70,340 to Rs. 1,60,340.
2. Madras ..	18,125 0 0	5 years.	Sept. 1931.	3,060 0 0	.....	.....	.....	3,060 0 0	
3. Punjab-Lyallpur Ginnery ..	18,125 0 0	3 years.	April 1931.	18,125 0 0	110,825 0 0	17,300 0 0	1,242 4 9	23,637 11 3	
4. Sind ..	93,000 0 0	3 years.	March 1930.	24,889 0 0	.....	.....	.....	8,065 14 3	
5. Hyderabad State ..	15,000 0 0	About 3 years.	Sept. 1930.	43,416 2 6	.....	.....	.....	43,416 2 6	
6. Central Provinces ..	92,975 8 0			.....	.....	.....	.....	.....	As per budget; details of actual expenditure awaited.

APPENDIX XI.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932.

INDIAN CENTRAL COTTON COMMITTEE OFFICE.

1. Secretary .. .. .	.. .. .	Mr. J. H. Ritchie, M.A., B.Sc., I.A.S.	..	On deputation from Central Provinces Department of Agriculture. (On leave.)
2. Deputy Secretary .. .. .	.. .. .	Mr. P. H. Rama Reddi, M.A., B.Sc., I.A.S.	..	On deputation from Madras Department of Agriculture. (Off. Secretary.)
3. Publicity and Propaganda Officer .. .. .	.. .. .	Mr. R. D. Mhwa, M.A. Agri. (Oxon.), Post-Grad., Dip. Agri. (Oxon.), B.Litt., Rural Econ. (Oxon.).	..	—

TECHNOLOGICAL LABORATORY, BOMBAY.

4. Director .. .. .	.. .. .	Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.)	..	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga, Bombay.
5. Spinning Master .. .. .	.. .. .	Mr. R. P. Richardson, F.T.I.	..	Demonstrator (Cotton Spinning), Technical School, Oldham.
6. Senior Research Assistant (Chemist) .. .. .	.. .. .	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bonn.), A.I.I.Sc., A.I.C.	..	Research Student at the Indian Institute of Science and Manchester College of Technology.
7. Senior Research Assistant (Assistant Technologist) .. .. .	.. .. .	Mr. D. F. Kapadia, B.Sc., Tech. (Manch.), B.A. (Bom.)	..	Research Scholar, Technological Laboratory (Textile Physics).
8. Senior Research Assistant (Physicist) .. .. .	.. .. .	Mr. N. Hari Rao, M.Sc. (Calcutta)	..	Research Scholar, Technological Laboratory (Textile Physics).
9. Senior Research Assistant (Physicist) .. .. .	.. .. .	Mr. Ram Naran Koshal, M.Sc. (Punjab)	..	Research Scholar, Technological Laboratory (Textile Physics).

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1932—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

10.	Junior Research Assistant (Microscopist).	..	..	Mr. Amar Nath Gulati, M.Sc. (Punjab)	..	Imperial Institute of Veterinary Research, Mukteswar, U. P.	•
11.	Junior Research Assistant	..	..	Mr. C. Nanjundayya, M.Sc. (Calcutta)	..	Research Scholar, Technological Laboratory (Textile Physics).	•
12.	Statistician	..	..	Mr. V. Venkataraman, M.A. (Madras)	..	Statistical Assistant, Labour Office, Government of Bombay, Bombay.	•
13.	Temporary Research Assistant	..	..	Mr. R. N. Mathur, M.Sc. (Allahabad)	..	Research Scholar, University Laboratories, Allahabad and Lahore.	•
14.	Electrician	..	..	Mr. Herculano Lobo, L.E.E. (V. J. T. I.)	..	—	•
15.	Junior Tester	..	..	Mr. S. S. Sukthankar, L.T.C. (V. J. T. I.)	..	—	•
16.	Junior Tester	..	..	Mr. K. G. Deo	..	—	•
17.	Junior Tester	..	..	Mr. H. B. B. Joshi, B.Sc.	..	—	•
18.	Junior Tester	..	..	Mr. K. S. Marar, B.A., LL.B.	..	—	•
19.	Junior Tester	..	..	Mr. R. G. Panvalkar, B.Sc.	..	—	•
20.	Junior Tester	..	..	Mr. G. D. Bhide, B.Sc.	..	—	•
21.	Junior Tester	..	..	Mr. K. V. N. Nayar	..	—	•
22.	Junior Tester	..	..	Mr. V. N. Modak, B.Sc.	..	—	•
23.	Junior Tester	..	..	Mr. L. V. Sundaraman, B.A.	..	—	•
24.	Junior Tester	..	..	Mr. P. S. Sambamurthi	..	—	•
25.	Junior Tester	..	..	Mr. G. J. Kharkar, B.Sc.	..	—	•
26.	Junior Tester	..	..	Mr. Sassoon Samson, B.Sc.	..	—	•

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1932—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

27. Junior Tester ..	..	..	Mr. A. J. Farid ..	..	..	..	—
28. Junior Tester ..	..	..	Mr. U. K. Benegal, B.A.	..	..	..	—
29. Junior Tester ..	..	..	Mr. P. V. Nachane, B.Sc.	..	..	..	—
30. Spinning Assistant ..	..	..	Mr. N. Iyengar ..	..	..	..	—
31. Statistical Clerk ..	..	..	Mr. R. Krishna Iyer ..	..	..	..	—
32. Statistical Clerk ..	..	..	Mr. P. K. Wagle ..	..	..	..	—

INSTITUTE OF PLANT INDUSTRY, INDORE.

33. Director	Mr. F. Keith Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab).	..	Director of Research, Department of Agriculture, Iraq (1923-30).
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34. Extension Officer	Mr. Misri Lal Saksena, L.Ag. (Cawnpore)	..	Six years as Assistant Farm Superin- tendent, United Provinces Subordi- nate Agricultural Service.
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35. Senior Farm Assistant	Mr. G. C. Tambe, B.Ag. (Bombay)	..	—
36. Chief Chemical Assistant	Mr. Y. D. Wad, M.A., M.Sc. (Bombay)	..	Research Student, Indian Central Cotton Committee.
37. Plant Breeding Assistant	Mr. Kuber Singh, B.Ag. (Bombay)	..	—

38. Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad)	..	—
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39. Chemical Assistant	Mr. V. G. Panse, B.Sc. (Bombay)	..	—
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40. Personal Assistant	* Mr. A. N. Srivastava, M.Sc. (Lucknow)	..	—
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41. Junior Farm Assistant	Mr. S. C. Talesara, B.Ag. (Bombay)	..	Research Student, Indian Central Cotton Committee.
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42. Junior Farm Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	..	—
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43. Junior Farm Assistant	Mr. G. G. Phadke, L.Ag. (Nagpur)	..	—
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LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN FUNDS AS ON AUGUST 31st, 1932—*contd.*

CENTRAL COTTON COMMITTEE'S

BOMBAY RESEARCH SCHEMES—*contd.*

(v) *Jalgaon Cotton Breeding Scheme.*

56. Botanical Graduate Assistant ..	Mr. V. L. Bhoskar, B.Ag. ..	..	..	On deputation from Bombay Department of Agriculture.
57. Pathological Graduate Assistant ..	Mr. J. D. Ranadive, B.Ag. ..	..	..	Research Student, Indian Central Cotton Committee.
58. Non-Graduate Assistant ..	Mr. P. A. Rao ..	..	..	—

BOMBAY SEED DISTRIBUTION SCHEMES.

(i) *Hubli and Gadag.*

59. Graduate Assistant ..	Mr. B. S. Patil, B.Ag. (Bombay) ..	..	..	—	Rs 4
60. Graduate Assistant ..	Mr. B. M. Dhumma, B.Ag. (Bombay) ..	..	..	—
61. Manager, Seed Farm, Gadag ..	Mr. G. Y. Kurli ..	..	..	On deputation from Bombay Department of Agriculture.	
	(ii) <i>Surat.</i>				
62. Cotton Assistant ..	Mr. V. D. Desai ..	..	..	On deputation from Bombay Department of Agriculture.	

(iii) *Khandesh (Banilla Scheme).*

Stage II.

63. Superintendent, Bhadgaon Farm ..	Mr. D. M. Kulkarni, B.Ag. ..	..	..	On deputation from Bombay Department of Agriculture.	
64. Non-Graduate Assistant ..	Mr. J. T. Bokil ..	..	..	Do.	do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*contd.*
BOMBAY SEED DISTRIBUTION SCHEMES—*contd.*

		<i>Stages III, IV and V.</i>			
65.	Cotton Superintendent, Jalgaon	..	Mr. S. V. Shevade, L.Ag.	..	..
66.	Graduate Assistant	..	..	Mr. R. B. Nimbalkar, B.Ag.	..
	
	
67.	Cotton Physiologist, Sakrand	..	Mr. B. M. Dabral, M.Sc. (Benares)	..	..
68.	Senior Assistant	..	..	Vacant.	..
69.	Junior Assistant	..	..	Mr. Rustom M. Ranji, Dip.Ag. (Bombay)	..
70.	Junior Assistant	..	..	Mr. R. G. Deshpande, B.Ag. (Bombay)	..
	
71.	Cotton Supervisor, Indus Right Bank, Dadu.	..	..	..	..
	
72.	Cotton Supervisor, Indus Left Bank, Mirpurkhas.	..	..	..	..
	
73.	Senior Assistant to Cotton Supervisor, Indus Right Bank.	..	..	..	..
	
74.	Senior Assistant to Cotton Supervisor, Indus Left Bank.	..	..	..	..
	
75.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	..	..	..	..
	
76.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	..	..	..	..
	
77.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	..	..	..	..
	
78.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	..	..	..	..
	

On deputation from Bombay Department of Agriculture.
Do. do.

SIND PHYSIOLOGICAL RESEARCH SCHEME.

On deputation from Bombay Department of Agriculture.
Do. do.

SIND SEED DISTRIBUTION SCHEME.

Research Student, Indian Cotton Committee.
On deputation from Bombay Department of Agriculture.

Research Student, Indian Cotton Committee.

On deputation from Sind Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1932—*contd.*

CENTRAL PROVINCES BOTANICAL RESEARCH SCHEME.

79.	Economic Botanist for Cotton ..	..	Mr. D. N. Mahta, B.A. (Oxon.), F.I.S.	..	On deputation from Central Provinces Department of Agriculture. (On leave.)	
80.	Assistant to Economic Botanist for Cotton.		Mr. S. C. Roy, L.Ag., and Post Graduate, Pusa.		On deputation from Central Provinces Department of Agriculture. (Officiating Economic Botanist for Cotton.)	
81.	Assistant to Economic Botanist for Cotton.		Mr. S. S. Pande, M.Sc. (Punjab)	..	Research Student, Indian Central Cotton Committee.	
82.	Assistant to Economic Botanist for Cotton.		Mr. D. G. Savargaonkar, L.Ag. (Hons.)	..	On deputation from Central Provinces Department of Agriculture.	
83.	Assistant to Economic Botanist for Cotton.		Mr. D. L. Janoria, L.Ag. (Hons.)	..	Do.	120
84.	Assistant to Economic Botanist for Cotton.		Mr. D. Y. Bhand, L.Ag. (Hons.)	..	Do.	120
85.	Assistant to Economic Botanist for Cotton.		Mr. V. N. Paranjpe, B.Sc.	..	..

MADRAS RESEARCH SCHEMES.

(i) *Herbaceum.*

86.	Senior Assistant ..	..	..	..	Mr. R. Balasubramaniam, B.A., B.Sc. (Ag.) ..	On deputation from Madras Department of Agriculture.
87.	Assistant ..	..	..	..	Mr. G. Seshadri Ayyangar, M.A.	..
88.	Assistant ..	..	..	..	Mr. V. Rameswami Mudaliar, B.A.	..
89.	Sub-Assistant ..	..	..	..	Mr. D. Devasirvatham, Government Tech. Examination in Botany (Intermediate).	On deputation from Madras Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1932—*contd.*

MADRAS RESEARCH SCHEMES—*contd.*

(ii) *Pempheres and Physiological.*

90. Assistant Botanist	..	..	..	Mr. K. K. Dharmarajulu, B.Sc. (Bombay), M.Sc. (Bombay).	Research Student, Indian Cotton Committee.	Centre
91. Assistant Chemist	..	..	..	Mr. M. Suryanarayana, B.Sc. (Calcutta)	..	On deputation from Madras Department of Agriculture.
92. Assistant Entomologist	..	..	..	Mr. E. R. Gopala Menon, B.A. (Hons.) (Madras).	Do.	do.
93. Junior Assistant	..	..	..	Mr. S. Sundaram, B.A., B.Sc. (Agri.)	..	Do.

(iii) *Fodder Cholam.*

MADRAS SEED DISTRIBUTION SCHEME.

94. Business Manager, Tirupur Loan and Sale Society.	Mr. K. Avudainayakan Pillai, L.Ag.	..	Do.
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PUNJAB RESEARCH SCHEMES.

(i) *Botanical.*

95. Acting Cotton Research Botanist	Mr. Mohd. Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A. (Trinidad).	Research Student, Indian Central Cotton Committee and State Research Scholar. On deputation from Punjab Department of Agriculture.	
96. Assistant to Cotton Research Botanist.	..	..	..	Chaudhri Mohammad Akbar, L.Ag.	..	On deputation from Punjab Department of Agriculture.
97. Technical Assistant	..	..	..	Bh. Sarup Singh, L.Ag.	..	Do.
98. Junior Research Assistant	..	..	..	Mr. Akbar Ali, B.Sc. (Post Graduate)	..	Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1932—*contd.*

PUNJAB RESEARCH SCHEMES—(*contd.*)

		(i) <i>Botanical</i> — <i>contd.</i>			
99.	Technical Assistant	..	..	Mr. Ramesh Chander, M.Sc. (Agri).	.. On deputation from Punjab Department of Agriculture.
100.	Technical Assistant	..	..	Ch. Mohammad Rashid Khan, L.C. Course, Munshi Fazil.	Do. do.
101.	Assistant Physiologist and Microscopist.	..	..	S. Sant Singh Verma, M.Sc. (Benares)	.. Research Student, Indian Central Cotton Committee.
102.	Statistical Assistant	..	..	Mr. S. Subramonia Iyer, B.A. (Hons.), M.A. (Madras).	—
(ii) <i>Entomological</i> .					
103.	Assistant Cotton Entomologist	..	..	Mr. M. Haroon Khan, B.Sc. (Hons.) (London), A.R.C.S. (London).	—
104.	Field Assistant, Sialkot Research Work.	..	..	Mr. Ladhia Ram, B.Sc.	—
105.	Field Assistant, Rohtak Research Work.	..	..	L. Ganda Ram, B.Sc., F.E.L.	—
106.	Field Assistant, Lyallpur Research Work.	..	..	Mr. Nazir Ahmad, M.Sc.	—
107.	Statistical Assistant	..	..	L. Sham Narain, B.Sc. (Agri.)	—
(iii) <i>White Fly</i> .					
108.	Assistant Cotton Entomologist	..	..	L. Kedar Nath Trehan, M.Sc. (Punjab)	.. Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.
109.	Field Assistant	..	..	Mr. Piere Mohan Verma, B.Sc. (Hons.) (Punjab), M.Sc.	.. Research Student, Indian Central Cotton Committee.
110.	Field Assistant	..	..	L. Prem Rattan Mahjor, M.Sc. (Agri.)	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1932—*contd.*

UNITED PROVINCES ENTOMOLOGICAL RESEARCH SCHEME.

111.	Special Research Assistant	Mr. H. D. Nangpal, M.Sc. (Hons. School) (Punjab).	Research Student, Indian Central Cotton Committee.
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HYDERABAD RESEARCH SCHEMES.

(i) *Botanical.*

112.	Cotton Research Botanist	Rai Sahib Kalidas Sawhney, M.Sc. (Punjab).	Late Cotton Breeder in the Department of Agriculture, Iraq, Baghdad.
113.	Assistant Cotton Research Botanist	..	..	Mr. D. V. Narayanyya, Dip. Agri. (Bombay).	On deputation from Bombay Department of Agriculture.
114.	Assistant Cotton Research Botanist	..	..	Mr. V. K. Bederker, B.A. (Madras), B.Ag. (Bombay).	On deputation from H. E. H. the Nizam's Department of Agriculture.

(ii) *Cotton Survey.*

115.	Assistant Cotton Research Botanist	Mr. B. B. Mulechandani, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
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HYDERABAD SEED DISTRIBUTION SCHEME.

116.	Inspector	Mr. M. V. Chitnis	..
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BIKANER GANG CANAL RESEARCH SCHEME.

117.	Assistant to Agricultural Officer, Bikaner State.	Mr. N. S. Apte, B.Ag. (Bombay)	..
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BARODA RESEARCH SCHEMES.

(i) *Root Rot.*

118.	Cotton Breeder	Mr. M. S. Pandya, B.Ag. (Bombay)	..
119.	Mycological Assistant	..	..	Mr. D. G. Limaye, B.Ag. (Bombay)	..

On deputation from Bombay Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1932—*concl.*

BARODA RESEARCH SCHEMES—*contd.*

(i) *Root Rot*—*contd.*

120. Breeding Assistant	Mr. A. F. Patel, B.Ag. (Bombay)	—
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(ii) *Comparative Tests between 1027 and 1A Cottons.*

121. Supervisor	Mr. Pragji Ranchhodji Desai, L.Ag. (Bombay).	—
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TECHNOLOGICAL ASSISTANTS PAID BY INDIAN CENTRAL COTTON COMMITTEE.

122. Under Cotton Specialist, Coimbatore	..	Mr. R. L. N. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.
123. Under Cotton Breeder, Dharwar	..	Mr. H. R. Nayak, Inter Science (Madras)	.. ..	..	Formerly Junior Tester at Technological Laboratory, Bombay.
124. Under Cotton Research Botanist, Lyallpur.	..	Mr. K. R. Sen, M.Sc. (Dacca)	.. ..	..	Research Student, Indian Central Cotton Committee.
125. Under Deputy Director of Agriculture, Gujerat, Surat.	..	Mr. Srinagabhushana, B.Sc. (Mysore)	.. ..	..	Do. do.

APPENDIX XII.

LIST OF RESEARCH STUDENTS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
1923	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur ..	.. Cotton Entomology.	....	Late Assistant Entomologist, Pink Bollworm Research Scheme, Punjab. Recently in Agricultural Department, Kenya.
"	Mohammed Afzal, B.Sc. (Punjab).	Lyallpur ..	.. Cotton Botany (Plant Breeding).	Punjab Agricultural Department. Acting Cotton Research Botanist, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
"	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur ..	.. Do.	.. Assistant to Economic Botanist for Cotton, Central Provinces, Botanical Research Scheme.	Do.
"	Jiwan Singh, M.Sc. (Punjab).	Do. ..	.. Cotton Mycology	.. Reader in Botany, Khalsa College, Amritsar.	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.
"	Ilabanto Banerji, M.Sc. (Calcutta).	Coimbatore ..	.. Cotton Botany	.. University Lecturer in Botany, Calcutta University, from 31st January 1929.	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

LIST OF RESEARCH STUDENTS—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
1923	B. B. Desai, B.Ag. (Bombay).	Dharwar ..	Cotton Botany ..	Bombay Agricultural Service, Cotton Breeder, Sind.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore..	Do.	Lecturer in Botany, Cotton College, Gauhati, Assam.	.....
"	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
"	H. D. Nangpal, M.Sc., Honours School (Punjab).	Cawnpore ..	Cotton Entomology ..	Special Research Assistant, Pink Boll-worm Investigation, United Provinces.	Do. ,
"	Sant Bahadur Singh, M.Sc. (Benares Hindu University)	Surat ..	Cotton Physiology. .	.....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore ..	Cotton Entomology ..	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Boll-worm Investigation Scheme.
"	Akbar Ali, B.Sc. (Punjab) ..	Lyalpur ..	Cotton Botany (Plant Breeding).	Punjab Agricultural Department, Junior Research Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.

LIST OF RESEARCH STUDENTS—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
1925	Kidar Nath Trehan, M.Sc. (Punjab).	Lyalpur ..	Cotton Entomology.	Punjab Agricultural Department, Assistant Cotton Entomologist, White Fly Investigation Scheme, Punjab.	Held Senior Research Studentship for study of "White Fly" problem at Khanewal. Indian Central Cotton Committee.
"	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Abroad for further study ..	Technological Assistant, Dharwar, up to 31st July 1929.
"	J. D. Ranadive, B.Ag. (Bombay).	Technological Research Laboratory, Dharwar ..	Cotton Mycology ..	Pathological Assistant, Cotton Breeding, scheme, Khandesh.	Indian Central Cotton Committee.
"	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Do. ..	Resigned in July 1925.
"	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee.
"	L. N. Rao, M.Sc. (Calcutta) ..	Do. ..	Cotton Microscopy. ..	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926	D. F. Kapadia, B.A. (Bombay), B.Sc. (Tech, Manchester).	Do. ..	Cotton Technology ..	Senior Research Assistant, Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
"	Ram Saran Koshal, M.Sc. (Punjab).	Do. ..	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Do.

LIST OF RESEARCH STUDENTS—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
1926	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat.	Cotton Physiology.	Bombay Agricultural Department, Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	....
"	Karam Singh Lamba, B.Sc., Honours School (Punjab).	Lyalpur	Cotton Entomology.	....	Resigned in July 1927.
"	Y. D. Wad, M.A., M.Sc. (Bombay).	Coimbatore.	Cotton Bio-chemistry.	Chief Chemical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
"	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany	Bombay Agricultural Department, Cotton Supervisor, Indus Right Bank Cotton Extension Scheme, Sind.	Do.
"	S. C. Talesara, B.Ag. (Bombay).	Do.	Do.	Junior Farm Assistant, Institute of Plant Industry, Indore.	Do.
1927	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology	Technological Assistant, Coimbatore.	Do.
"	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
"	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyalpur	Cotton Entomology.	Government scholar for study abroad.	Obtained Ph. D. (Cantab.)
"	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Do.	Do.	Obtained Doctorate at Edinburgh.
"	Shripad Shamrao Rane, M.Sc. (Benares Hindu University).	Institute of Plant Industry, Indore.	Cotton Physiology.	Unemployed	....

LIST OF RESEARCH STUDENTS—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
1927	Sant Singh Varma, M.Sc. (Benares Hindu University).	Dharwar ..	Cotton Physiology in connection with Cotton . . . Wilt Investigation.	Temporary Assistant Physiologist, Punjab Botanical Research Scheme.	Granted a Foreign Scholarship by the Indian Central Cotton Committee.
"	Lakshmi Narayan Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
"	Kadaba Rangaawamy, M.Sc. (Calcutta).	Coimbatore ..	Do. ..	Unemployed ..	....
"	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Agricultural Officer, Bikaner State.	....
1928	K. Dharmarajulu, M.Sc. (Bombay).	Dharwar ..	Cotton Mycology ..	Assistant Botanist, Madras Pempheles and Physiological Scheme.	Indian Central Cotton Committee.
"	Piave Mohan, B.Sc., Honours School (Punjab).	Cawnpore ..	Cotton Entomology ..	Field Assistant, White Fly Investigation, Punjab.	Do.
"	R. N. Gidwani, B.Ag. (Bombay).	Surat ..	Cotton Agronomy ..	Senior Assistant to Cotton Supervisor, Indus Left Bank Cotton Extension Scheme, Sind.	Do.
"	M. Kanti Raj, M.A., B.Sc. (Agri.), (University of Edinburgh).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Madras Agricultural Service, Personal Assistant to the Director of Agriculture, Madras.	....
"	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology ..	Junior Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
1929	Srinagabhushana, B.Sc. ..	Do.	Do. ..	Technological Assistant, Surat.	Do.
"	Bhai Pratap Singh Bhullar, B.Sc. (Agri.) (Punjab).	Lyallpur ..	Cotton Marketing and Economics.	Punjab Agricultural Department.	....
"	Bhai Ajai Singh Gulzar, B.Sc. (Agri.) (Punjab).	Do. ..	Do. ..	Do. ..	....

LIST OF RESEARCH STUDENTS—*concd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
1930	Madan Lal Bhatia, M.Sc. (Punjab).	Lyallpur	Entomology.. ..	Research Student }	Under training.
	Bhola Nath, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cytology and Plant Breeding.	Do. }	
	Pran Nath Mehra, M.Sc. (Punjab).	Sakrand	Do. ..	....
	Brajendra Nath Bhargava, M.A. (Lucknow).	Lucknow	Cotton Marketing and Economics.	Research Student ..	
1931	B. S. Sheshgiri, B.Ag. (Bombay).	Surat, Gujarat ..	Cotton Marketing and Economics.	Under training.
	K. R. Dube, B.Ag. (Nagpur).	Nagpur	Do. ..	Research Student }	Under training.
	Santokh Singh Jaggi, B.Sc. (Agri.) (Punjab).	Lyallpur	Do. ..	Do. }	
	Doraiswami Ayyar, B.A., B.Sc. (Agri.) (Madras).	Madras	Do. ..	Do. }	

"Indian Central Cotton Committee" in the remarks column indicates a post paid for from one of the Committee's Research Grants.

